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## CLAIMS

(57) [Claim(s)]

[Claim 1] The stator of the AC generator characterized by for the 1st coil of the above and the 2nd coil of the above which are characterized by providing the following, and with which each phase is constituted from an electrical angle by the three-phase-circuit line winding which has phase contrast 120 degrees, and constitutes the same phase in the above-mentioned coil assembly to be connected by the same address passage connection at the same address, respectively, and to arrange the same above-mentioned address passage connection of each phase by the slot pitch  $4n$  or more. The stator core of the shape of a cylinder which the slot prolonged in shaft orientations becomes from the layer-built iron core formed in the hoop direction in the predetermined pitch. [ two or more ] The strand which consists of a successive line is turned up out of the above-mentioned slot by the side of the end face of the above-mentioned stator core. It has the stator winding which consists of two or more coils which are looped around and become so that a inner layer and an outer layer may be taken by turns in the slot depth direction within the above-mentioned slot for every number of predetermined slots. two or more above-mentioned coils It consists of at least 1 set of coil assemblies which folded up two or more above-mentioned strands simultaneously, and were formed. the above-mentioned coil assembly A bay is connected by the turn section and arranged by the predetermined slot pitch. And the two above-mentioned strands formed in the pattern shifted so that this adjacent bay might take a inner layer and an outer layer by turns in the slot depth direction by this turn section The strand pair which comes to arrange the above-mentioned predetermined slot pitch staggering \*\*\*\*\* bay in piles mutually One slot pitch is shifted at a time, and a same number pair array is carried out with the above-mentioned number of predetermined slots, and it is constituted. the above-mentioned coil assembly The 1st volume track group which comes to arrange the 1st coil of 1 turn constituted by looping around so that the above-mentioned stator core was equipped, and might be taken the above-mentioned strand in the slot depth direction within the above-mentioned slot and a inner layer and an outer layer might be taken by turns for every above-mentioned number of predetermined slots by one slot pitch by the same number as the above-mentioned number of predetermined slots. Constituting a pair with the 2nd volume track group which it comes to arrange by the number as the above-mentioned number of predetermined slots with the 2nd coil of 1 turn which consisted of the 1st coil of the above, and an electrical angle by shifting 180 degrees and carrying out reversal looping around same at one slot pitch so that may be taken the above-mentioned strand in the slot depth direction within the above-mentioned slot and a inner layer and an outer layer may be taken by turns for every number of predetermined slots, the above-mentioned stator winding is the slot of  $n$  \*\*\*\*\*.

[Claim 2] The stator of the AC generator characterized by to be connected by the same address passage connection at an address which is different by the interphase which the 1st coil of the above which is characterized by to provide the following, and with which each phase is constituted from an electrical angle by the three-phase-circuit line winding which has phase contrast 120 degrees, and constitutes the same phase in the above-mentioned coil assembly, and the 2nd coil of the above adjoin, and to be arranged the same above-mentioned address passage connection of each phase by the The stator core of the shape of a cylinder which the slot prolonged in shaft orientations becomes from the layer-built iron core formed in the hoop direction in the predetermined pitch. [ two or more ] The strand which consists of a successive line is turned up out of the above-mentioned slot by the side of the end face of the above-mentioned stator core. It has the stator winding which consists of two or more coils which are looped around and become so that a inner layer and an outer layer may be taken by turns in the slot depth direction within the above-mentioned slot for every number of predetermined slots. two or more above-mentioned coils It consists of at least 1 set of coil assemblies which folded up two or more above-mentioned strands simultaneously, and were formed. the above-mentioned coil assembly A bay is connected by the turn section and arranged by the predetermined slot pitch. And the two above-mentioned strands formed in the pattern shifted so that this adjacent bay might take a inner layer and an outer layer by turns in the slot depth direction by this turn section The strand pair which comes to arrange the above-mentioned predetermined

slot pitch staggering \*\*\*\*\* bay in piles mutually One slot pitch is shifted at a time, and a same number pair array is carried out with the above-mentioned number of predetermined slots, and it is constituted. the above-mentioned coil assembly The 1st volume track group which comes to arrange the 1st coil of 1 turn constituted by looping around so that the above-mentioned stator core was equipped, and might be taken the above-mentioned strand in the slot depth direction within the above-mentioned slot and an inner layer and an outer layer might be taken by turns for every above-mentioned number of predetermined slots by one slot pitch by the same number as the above-mentioned number of predetermined slots. Constituting a pair with the 2nd volume track group which it comes to arrange by the number as the above-mentioned number of predetermined slots with the 2nd coil of 1 turn which consisted of the 1st coil of the above, and an electrical angle by shifting 180 degrees and carrying out reversal looping around same at one slot pitch so that may be taken the above-mentioned strand in the slot depth direction within the above-mentioned slot and an inner layer and an outer layer may be taken by turns for every number of predetermined slots, the above-mentioned stator winding is the slot of n \*\*\*\*\*.

[Claim 3] Two or more above-mentioned coils are the stators of the AC generator according to claim 1 or 2 characterized by for the coil in the same coil group of the above-mentioned 1st volume track group or the above-mentioned 2nd volume track group which consists of two or more sets of above-mentioned coil assemblies, and constitutes the same phase in two or more sets of above-mentioned coil assemblies crossing, and connecting it at the contiguity address.

[Claim 4] The stator of an AC generator given in any of the claim 1 characterized by looping the above-mentioned stator core around 2 sets of above-mentioned coil assemblies in the direction of a path together with two trains, and for each phase which constitutes the above-mentioned three-phase-circuit line winding connecting in series the above 1st and the 2nd coil around which the same slot group was looped, and being constituted by the coil of 4 turns, or a claim 3 they are.

[Claim 5] Each phase of the above-mentioned three-phase-circuit line winding is the stator of the AC generator according to claim 4 characterized by for the above 1st between 2 sets of above-mentioned coil assemblies and the coil edge of the 2nd coil being connected by two contiguity address passage connection, and for the above 1st in the above-mentioned coil assembly of one group and the coil edge of the 2nd coil being connected by one same address passage connection, and being constituted by the coil of 4 turns.

[Claim 6] Each phase of the above-mentioned three-phase-circuit line winding is the stator of the AC generator according to claim 4 characterized by for the above 1st in the above-mentioned coil assembly of each class and the coil edge of the 2nd coil being connected by one same address passage connection, respectively, and for the above 1st between 2 sets of above-mentioned coil assemblies and the coil edge of the 2nd coil being connected by one contiguity address passage connection, and being constituted by the coil of 4 turns.

[Claim 7] The stator of the AC generator according to claim 1 to 3 characterized by looping the above-mentioned stator core around 3 sets of above-mentioned coil assemblies in the direction of a path together with three trains, and for each phase which constitutes the above-mentioned three-phase-circuit line winding connecting in series the above 1st and the 2nd coil around which the same slot group was looped, and being constituted by the coil of 6 turns.

[Claim 8] The stator of the AC generator according to claim 1 to 7 characterized by for the same above-mentioned address passage connection crossing, and being carried out using the metal terminal for connection.

[Claim 9] The stator of the AC generator according to claim 1 to 8 characterized by connecting the coil edge which constitutes the neutral point of the above-mentioned three-phase-circuit line winding using the metal terminal for neutral point connection.

[Claim 10] The stator of the AC generator according to claim 9 characterized by forming the neutral point drawer lead in the above-mentioned metal terminal for neutral point connection at one.

[Claim 11] The stator of the AC generator according to claim 9 or 10 characterized by unifying the above-mentioned metal terminal for passage connection, and the above-mentioned metal terminal for neutral point connection with the insulating resin.

[Claim 12] The stator of the AC generator according to claim 1 to 11 characterized by performing connection of the above 1st and the 2nd coil by arc welding.

[Claim 13] The stator of the AC generator according to claim 1 to 12 characterized by the cross-section configuration of the above-mentioned strand being an abbreviation flat configuration.

[Claim 14] The stator of the AC generator according to claim 1 to 13 characterized by carrying out the mould of the coil end of the above-mentioned stator winding with the insulating resin.

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## DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the stator structure of the AC generator for vehicles especially carried in vehicles, such as a passenger car and a truck, about the stator of the AC generator driven with an internal combustion engine.

[0002]

[Description of the Prior Art] the side elevation showing the important section of the stator of the conventional AC generator for vehicles with which drawing 22 was indicated by the Japanese patent No. 2927288, and the conductor applied to the stator of the conventional AC generator for vehicles with which drawing 23 was shown in drawing 22 -- the perspective diagram, drawing 24, and drawing 25 which show a segment are the perspective diagram which looked at the important section of the stator of the conventional AC generator for vehicles shown in drawing 22 from front and rear \*\*, respectively The stator 50 is equipped with the stator core 51, the stator winding 52 around which the stator core 51 was looped, and the insulator 53 with which it is equipped in slot 51a, and a stator winding 52 is insulated to a stator core 51 in drawing 22 or drawing 25. Two or more stator cores 51 are formed in the hoop direction in the predetermined pitch so that slot 51a which is the layer-built iron core of the shape of a cylinder by which the laminating was carried out in piles, and is prolonged in shaft orientations may carry out opening of the thin steel plate to an inner circumference side. Here, corresponding to the number of magnetic poles (16) of a rotator (not shown), 96 slot 51a is formed so that 2 sets of coils of a three phase circuit may be held. the conductor of much short length [ stator winding / 52 ] -- a segment 54 is joined and it is constituted by the predetermined coil pattern

[0003] a conductor -- a segment 54 is what fabricated the copper-wire material of the rectangle cross section by which pre-insulation was carried out in the shape of abbreviation for U characters, and is inserted two [ at a time ] in every [ which was left 6 slot (1 pole pitch) ] two slot 51a from rear \*\* of shaft orientations and a conductor -- the edges which extend to the front side of a segment 54 are joined, and the stator winding 52 is constituted

[0004] concrete -- slot 51a of 6 slot remote each class -- setting -- one conductor -- a segment 54 with the 1st position from the periphery side in slot 51a of rear \*\* to one it inserts in the 2nd position from the periphery side in other slot 51a -- having -- one more conductor -- the segment 54 is inserted in the periphery side in other slot 51a to the periphery side in slot 51a of one to the 3rd position, and the 4th position from rear \*\* then -- the inside of each slot 51a -- a conductor -- four bay 54a of a segment 54 is arranged together with one train in the direction of a path and the conductor which extended from the periphery side in slot 51a of one from the 1st position to the front side -- the conductor which extended from the 2nd position to the front side from the periphery side in slot 51a besides 6 slot remote from slot 51a to edge 54b of a segment 54, and the clockwise rotation -- edge 54b of a segment 54 is joined and the outer layer coil of 2 turns is formed furthermore, the conductor which extended from the periphery side in slot 51a of one from the 3rd position to the front side -- the conductor which extended from the 4th position to the front side from the periphery side in slot 51a besides 6 slot remote from slot 51a to edge 54b of a segment 54, and the clockwise rotation -- edge 54b of a segment 54 is joined and the inner layer coil of 2 turns is formed furthermore, the conductor inserted in slot 51a of 6 slot remote each class -- the outer layer coil and inner layer coil which consist of segments 54 are connected in series, and the coil for one phase of 4 turns is formed the same -- carrying out -- a conductor -- it shifts at a time one slot of slot positions where a segment 54 is inserted, and the coil of 4 turns is formed by six phases, respectively And three-phase-circuit [ every ] alternating current connection is carried out, and these coils constitute the stator winding 52 which consists of 2 sets of three-phase-circuit line windings.

[0005] thus, two conductors inserted in slot 51a of the same group by rear \*\* of a stator core 51 in the constituted conventional stator 50 -- turn section 54c of a segment 54 is arranged together with the direction of a path

Consequently, turn section 54c is arranged by the hoop direction at two trains, and constitutes the coil and group of

rear \*\*. On the other hand, in the front side of a stator core 51 the conductor which extended from the periphery side in slot 51a of one from the 1st position to the front side -- the conductor which extended from the 2nd position to the front side from the periphery side in edge 54b of a segment 54, and 6 slot remote slot 51a -- with a joint with edge 54b of a segment 54 the conductor which extended from the periphery side in slot 51a of one from the 3rd position to the front side -- the conductor which extended from the 3rd position to the front side from the periphery side in edge 54b of a segment 54, and 6 slot remote slot 51a -- a joint with edge 54b of a segment 54 It is arranged together with the direction of a path. Consequently, the joint of edge 54b is arranged by the hoop direction at two trains, and constitutes the coil and group by the side of a front.

[0006]

[Problem(s) to be Solved by the Invention] the short length conductor by which the stator winding 52 was fabricated as mentioned above in the stator 50 of this conventional AC generator for vehicles in the shape of abbreviation for U characters -- the conductor which inserts a segment 54 in slot 51a of a stator core 51 from rear \*\*, and extends to a front side -- edge 54b of a segment 54 is joined and it is constituted Then, since the joint of edge 54b to which the insulating coat disappeared was arranged to the hoop direction and the coil and group by the side of a front were constituted by soldering and welding, it has the coil and structure which are easy to corrode with water-ed, and the corrosion resistance was very low. Moreover, the coil and the group have the structure where joints are easy to short-circuit 96 joints since it consists of joints of two trains, i.e., 192 places, and it was easy to cause short circuit accident. moreover, many short length conductors -- the segment 54 had to be inserted in the stator core 51, and edge 54b had to be joined by welding, soldering, etc., and workability had fallen remarkably moreover, a conductor -- the amount of pushing to slot 51a of a segment 54 needed more than the shaft-orientations length of a stator core 51, tended to attach a blemish to the insulating coat, and was reducing the quality behind a product Furthermore, at the time of junction of edge 54b, the short circuit between the joints by the solder lappet or welding \*\*\*\* occurred frequently, and mass-production nature was falling remarkably.

[0007] moreover, the conventional stator 50 -- setting -- a conductor -- edge 54b of a segment 54 -- the part -- a fixture -- clamping -- the peak section -- soldering -- it was welded and joined Then, between joints was narrow, while a coil and height became high, since the clamp area by the fixture was needed upwards and bulging of the soldering section or a weld zone arose. moreover, a conductor -- the case where edge 54b of a segment 54 is welded -- the temperature rise at the time of welding -- a conductor -- a segment 54 will soften and the rigidity as a stator will fall Consequently, when the conventional stator 50 was carried in the AC generator for vehicles, the leakage reactance of a coil and the coil of the section increased, the output got worse, and the draft resistance increased, the wind noise got worse, rigidity fell further, and the reduction effect of a magnetic noise had decreased.

[0008] This invention uses the coil assembly which arranged two or more coils of 1 turn which consist of a successive line, and constituted them in view of the technical problem of the above Prior arts. While reducing the junction mosquito place in a coil end remarkably, and raising a corrosion resistance and insulation, and raising the looping-around nature to the stator core of a coil and assembly nature and productivity improving Arrangement of the connection section between the coils which constitute a three-phase-circuit line winding is devised, and it aims at obtaining the stator of the AC generator with which the short circuit between the connection sections is beforehand prevented, and improvement in reliability is achieved.

[0009]

[Means for Solving the Problem] The stator core of the shape of a cylinder which the slot to which the AC generator concerning this invention extends in shaft orientations becomes from the layer-built iron core formed in the hoop direction in the predetermined pitch, [ two or more ] The long strand which consists of a successive line is turned up out of the above-mentioned slot by the side of the end face of the above-mentioned stator core. It has the stator winding which consists of two or more coils which are looped around and become so that a inner layer and an outer layer may be taken by turns in the slot depth direction within the above-mentioned slot for every number of predetermined slots. two or more above-mentioned coils It consists of at least 1 set of coil assemblies which folded up two or more above-mentioned strands simultaneously, and were formed. the above-mentioned coil assembly A bay is connected by the turn section and arranged by the predetermined slot pitch. And the two above-mentioned strands formed in the pattern shifted so that this adjacent bay might take a inner layer and an outer layer by turns in the slot depth direction by this turn section The strand pair which comes to arrange the above-mentioned predetermined slot pitch staggering \*\*\*\*\* bay in piles mutually One slot pitch is shifted at a time, and a same number pair array is carried out with the above-mentioned number of predetermined slots, and it is constituted. the above-mentioned coil assembly The 1st volume track group which comes to arrange the 1st coil of 1 turn constituted by looping around so that the above-mentioned stator core was equipped, and might be taken the above-mentioned strand in the slot depth direction within the above-mentioned slot and a inner layer and an outer layer might be taken by turns for every above-mentioned number of

predetermined slots by one slot pitch by the same number as the above-mentioned number of predetermined slots, So that may be taken the above-mentioned strand in the slot depth direction within the above-mentioned slot and a inner layer and an outer layer may be taken by turns for every number of predetermined slots And the 2nd coil of 1 turn which consisted of the 1st coil of the above and an electrical angle by shifting 180 degrees and carrying out reversal looping around constitutes a pair with the 2nd volume track group which it comes to arrange by the same number as the above-mentioned number of predetermined slots from one slot pitch. The above-mentioned stator winding is constituted by the three-phase-circuit line winding in which each phase which has the slot of  $n$  \*\*\*\*\* has phase contrast 120 degrees by the electrical angle. The 1st coil of the above and the 2nd coil of the above which constitute the same phase in the above-mentioned coil assembly are connected by the same address passage connection at the same address, respectively, and the same above-mentioned address passage connection of each phase is arranged by the slot pitch  $4n$  or more.

[0010] Moreover, the stator core of the shape of a cylinder which the slot prolonged in shaft orientations becomes from the layer-built iron core formed in the hoop direction in the predetermined pitch, [ two or more ] The strand which consists of a successive line is turned up out of the above-mentioned slot by the side of the end face of the above-mentioned stator core. It has the stator winding which consists of two or more coils which are looped around and become so that a inner layer and an outer layer may be taken by turns in the slot depth direction within the above-mentioned slot for every number of predetermined slots. two or more above-mentioned coils It consists of at least 1 set of coil assemblies which folded up two or more above-mentioned strands simultaneously, and were formed. the above-mentioned coil assembly A bay is connected by the turn section and arranged by the predetermined slot pitch. And the two above-mentioned strands formed in the pattern shifted so that this adjacent bay might take a inner layer and an outer layer by turns in the slot depth direction by this turn section The strand pair which comes to arrange the above-mentioned predetermined slot pitch staggering \*\*\*\*\* bay in piles mutually One slot pitch is shifted at a time, and a same number pair array is carried out with the above-mentioned number of predetermined slots, and it is constituted. the above-mentioned coil assembly The 1st volume track group which comes to arrange the 1st coil of 1 turn constituted by looping around so that the above-mentioned stator core was equipped, and might be taken the above-mentioned strand in the slot depth direction within the above-mentioned slot and a inner layer and an outer layer might be taken by turns for every above-mentioned number of predetermined slots by one slot pitch by the same number as the above-mentioned number of predetermined slots, So that may be taken the above-mentioned strand in the slot depth direction within the above-mentioned slot and a inner layer and an outer layer may be taken by turns for every number of predetermined slots And the 2nd coil of 1 turn which consisted of the 1st coil of the above and an electrical angle by shifting 180 degrees and carrying out reversal looping around constitutes a pair with the 2nd volume track group which it comes to arrange by the same number as the above-mentioned number of predetermined slots from one slot pitch. The above-mentioned stator winding is constituted by the three-phase-circuit line winding in which each phase which has the slot of  $n$  \*\*\*\*\* has phase contrast 120 degrees by the electrical angle. It is connected by the same address passage connection at an address which is different by the interphase which the 1st coil of the above which constitutes the same phase in the above-mentioned coil assembly, and the 2nd coil of the above adjoin, and the same above-mentioned address passage connection of each phase is arranged by the slot pitch  $2n$  or more.

[0011] Moreover, at the contiguity address, the coil in the same coil group of the above-mentioned 1st volume track group or the above-mentioned 2nd volume track group which two or more above-mentioned coils consist of two or more sets of above-mentioned coil assemblies, and constitutes the same phase in two or more sets of above-mentioned coil assemblies crosses, and is connected. Moreover, the above-mentioned stator core is looped around 2 sets of above-mentioned coil assemblies in the direction of a path together with two trains, and each phase which constitutes the above-mentioned three-phase-circuit line winding connects in series the above 1st and the 2nd coil around which the same slot group was looped, and is constituted by the coil of 4 turns.

[0012] Moreover, the above 1st between 2 sets of above-mentioned coil assemblies and the coil edge of the 2nd coil are connected by two contiguity address passage connection, and the above 1st in the above-mentioned coil assembly of one group and the coil edge of the 2nd coil are connected by one same address passage connection, and each phase of the above-mentioned three-phase-circuit line winding is constituted by the coil of 4 turns.

[0013] Moreover, the above 1st in the above-mentioned coil assembly of each class and the coil edge of the 2nd coil are connected by one same address passage connection, respectively, and the above 1st between 2 sets of above-mentioned coil assemblies and the coil edge of the 2nd coil are connected by one contiguity address passage connection, and each phase of the above-mentioned three-phase-circuit line winding is constituted by the coil of 4 turns.

[0014] Moreover, the above-mentioned stator core is looped around 3 sets of above-mentioned coil assemblies in the direction of a path together with three trains, and each phase which constitutes the above-mentioned three-phase-circuit



line winding connects in series the above 1st and the 2nd coil around which the same slot group was looped, and is constituted by the coil of 6 turns.

[0015] Moreover, the same above-mentioned address passage connection crosses, and it is carried out using the metal terminal for connection.

[0016] Moreover, the coil edge which constitutes the neutral point of the above-mentioned three-phase-circuit line winding is connected using the metal terminal for neutral point connection.

[0017] Moreover, the neutral point drawer lead is formed in the above-mentioned metal terminal for neutral point connection at one.

[0018] Moreover, the above-mentioned metal terminal for passage connection and the above-mentioned metal terminal for neutral point connection are unified with the insulating resin.

[0019] Moreover, connection of the above 1st and the 2nd coil is performed by arc welding.

[0020] Moreover, the cross-section configuration of the above-mentioned strand is an abbreviation flat configuration.

[0021] Moreover, the mould of the coil end of the above-mentioned stator winding is carried out with the insulating resin.

[0022]

[Embodiments of the Invention] Hereafter, the form of implementation of this invention is explained about drawing.

The cross section showing the composition of the AC generator for vehicles which form 1. drawing 1 of operation requires for the form 1 of implementation of this invention, The perspective diagram in which drawing 2 shows the stator of this AC generator for vehicles, the front view in which drawing 3 shows the important section of the stator of this AC generator for vehicles, The front view with which drawing 4 explains the connection state for one phase of the stator winding in this AC generator for vehicles, The front view with which drawing 5 explains the connection state for a three phase circuit of the stator winding in this AC generator for vehicles, The perspective diagram showing the terminal [ in / the stator of this AC generator for vehicles / in drawing 6 ] for three-phase-circuit alternating current connection and drawing 7 are drawings explaining the manufacturing process of the coil assembly which constitutes the stator winding by which the circuit diagram, drawing 8 , and drawing 9 of this AC generator for vehicles are applied to this AC generator for vehicles, respectively. Drawing 10 is drawing showing the coil assembly which constitutes the stator winding applied to this AC generator for vehicles, and (b of (a) of drawing 10 ) of the side elevation and drawing 10 is the plan. Drawing 11 is drawing showing the coil assembly which constitutes the stator winding applied to this AC generator for vehicles, and (b of (a) of drawing 11 ) of the side elevation and drawing 11 is the plan. The perspective diagram showing the important section of the strand which constitutes the stator winding by which drawing 12 is applied to this AC generator for vehicles, and drawing 13 are drawings explaining the array of the strand which constitutes the stator winding applied to this AC generator for vehicles. Drawing 14 is drawing explaining the structure of a stator core where this AC generator for vehicles is applied, and (b of (a) of drawing 14 ) of the side elevation and drawing 14 is the rear view. The process cross section with which drawing 15 explains the manufacturing process of the stator to which this AC generator for vehicles is applied, and drawing 16 are the process cross sections explaining the manufacturing process of the stator to which this AC generator for vehicles is applied.

[0023] It sets to drawing 1 , and it is equipped with the AC generator for vehicles free [ rotation ] through a shaft 6 in the case 3 where the run dollar type rotator 7 consisted of the drive side bearing brackets 1 and commutator side bearing brackets 2 made from aluminum, and it fixes to the internal surface of a case 3, and it is constituted so that a stator 8 may cover the periphery side of a rotator 7. The shaft 6 is supported by the drive side bearing bracket 1 and the commutator side bearing bracket 2 possible [ rotation ]. A pulley 4 fixes at the end of this shaft 6, and the rotation torque of an engine can be transmitted now to a shaft 6 through a belt (not shown). The slip ring 9 which supplies current to a rotator 7 fixes to the other end of a shaft 6, and it is contained by the brush holder 11 arranged in the case 3 so that the brush 10 of a couple might \*\*\*\* to this slip ring 9. HITOSHIKU 17 by which the regulator 18 which adjusts the size of the alternating voltage produced in the stator 8 was attached in the brush holder 11 is pasted. It connects with a stator 8 electrically and is equipped with the rectifier 12 which rectifies the alternating current produced in the stator 8 to a direct current in the case 3.

[0024] A rotator 7 is formed so that the rotator coil 13 which passes current and generates magnetic flux, and this rotator coil 13 may be covered, and it consists of field cores 20 and 21 of the couple in which a magnetic pole is formed of the magnetic flux generated with the rotator coil 13. The presser-foot-stitch-tongue-like magnetic poles 22 and 23 of eight presser-foot-stitch-tongue configurations protruded on the periphery edge by angular pitches [ hoop direction ], respectively, the field cores 20 and 21 of a couple are iron, they countered so that the presser-foot-stitch-tongue-like magnetic poles 22 and 23 might be engaged, and they have fixed at the shaft 6. Furthermore, the fan 5 has fixed to the ends of the shaft orientations of a rotator 7. moreover, inhalation of air -- Holes 1a and 2a are formed in the end face of the shaft orientations of a drive side bearing bracket 1 and a commutator side bearing bracket 2, and

exhaust holes 1b and 2b are countered and formed in the front side of a stator winding 16, the coil of rear \*\*, and the direction outside of a path of Groups 16a and 16b at the periphery both-shoulders section of a drive side bearing bracket 1 and a commutator side bearing bracket 2

[0025] The stator 8 is equipped with the stator core 15 which consists of the layer-built iron core of the shape of a cylinder by which two or more slot 15a prolonged in shaft orientations was formed in the hoop direction in the predetermined pitch, the stator winding 16 around which the stator core 15 was looped, and the insulator 19 with which it is equipped in each slot 15a, and a stator winding 16 and a stator core 15 are insulated electrically as shown in drawing 2 and drawing 3. And the stator winding 16 is equipped with 2 sets of coil assemblies 90 arranged in the direction of a path by two trains. It consists of two or more coils which the wave volume was carried out and were looped around so that one strand 30 might be turned up out of slot 15a by the side of the end face of a stator core 15 and the coil assembly 90 might take a inner layer and an outer layer by turns in the slot depth direction within slot 15a for every number of predetermined slots. And 2 sets of three-phase-circuit line windings 160 which carry out three-phase-circuit alternating current connection, and mention two or more coils later using the terminal 100 for three-phase-circuit alternating current connection are constituted. In addition, Oa, Ob, Oc, Na, Nb, and Nc among drawing 2 and drawing 3 The lead wire and the neutral point of each phase of 1 set of three-phase-circuit line windings 160 are expressed. Nabc one -- a set -- a three phase circuit -- a line winding -- 160 -- the neutral point -- an outgoing line -- expressing -- Oa -- ' -- Ob -- ' -- Oc -- ' -- Na -- ' -- Nb -- ' -- Nc -- ' -- Expressing the lead wire and the neutral point of each phase of 1 more set of three-phase-circuit line windings 160, Na'b'c' expresses the neutral point outgoing line of 1 more set of three-phase-circuit line windings 160. Moreover, C1-1 expresses the same address passage connection section of the 1st comrades mentioned later, and C2-3 express the 2nd contiguity address passage connection section [ 3rd ]. Here, corresponding to the number of magnetic poles of a rotator 7 (16), 96 slot 15a is formed in the stator core 15 at equal intervals so that 2 sets of three-phase-circuit line windings 160 may be held. That is, the number of slots of \*\*\*\*\* is 2. Moreover, the copper-wire material of the long picture which has the cross section of the rectangle by which pre-insulation was carried out, for example is used for a strand 30.

[0026] Below, the coil structure of the stator winding 161 for one phase is concretely explained with reference to drawing 4. The stator winding 161 for one phase consists of the 1st or 4th coil 31-34 which consists of one strand 30, respectively. And from No. 1 of the slot number to No. 91, a wave volume is carried out and it is constituted so that the 1st coil 31 may take one strand 30 every six slots and may take an inner circumference side to the inner circumference side in slot 15a to the 1st position, and the 2nd position by turns. From No. 1 of the slot number to No. 91, a wave volume is carried out and it is constituted so that the 2nd coil 32 may take a strand 30 every six slots and may take an inner circumference side to the inner circumference side in slot 15a to the 2nd position, and the 1st position by turns. From No. 1 of the slot number to No. 91, a wave volume is carried out and it is constituted so that the 3rd coil 33 may take a strand 30 every six slots and may take an inner circumference side to the inner circumference side in slot 15a to the 3rd position, and the 4th position by turns. From No. 1 of the slot number to No. 91, a wave volume is carried out and it is constituted so that the 4th coil 34 may take a strand 30 every six slots and may take an inner circumference side to the inner circumference side in slot 15a to the 4th position, and the 3rd position by turns. Thereby, the 1st or 4th coil 31-34 constitutes the coil of 1 turn which is looped around and becomes so that may be taken one strand 30 in the slot depth direction within slot 15a and a inner layer and an outer layer may be taken by turns every six slots, respectively. And in each slot 15a, a strand 30 arranges the longitudinal direction of the rectangular section in the direction of a path, and is arranged together with [ four ] one train in the direction of a path. Henceforth, the position of the strand 30 in slot 15a is called 1st street [ 2nd / 3rd / 4th ] from an inner circumference side. In addition, although not illustrated, every one slot 15a looped around a strand 30 is shifted, and the stator winding 161 for six phases is formed.

[0027] And coil edge 31b of the 1st coil 31 which extends from the 2nd street of No. 67 of the slot number to the end side of a stator core 15, Coil edge 33a of the 3rd coil 33 which extends from the 3rd street of No. 61 of the slot number crosses, and is connected (contiguity address passage connection C2-3). subsequently Coil edge 32b of the 2nd coil 32 which extends from the 2nd street of No. 61 of the slot number, Coil edge 31a of the 1st coil 31 which coil edge 34a of the 4th coil 34 which extends from the 3rd street of No. 55 of the slot number crosses, is connected (contiguity address passage connection C2-3), and extends from the 1st street of No. 61 of the slot number further, Coil edge 32a of the 2nd coil 32 which extends from the 1st street of No. 55 of the slot number crosses, and is connected (the same address passage connection C1 -1). Thereby, the 1st or 4th coil 31-34 is connected in series, and the stator winding 161 for one phase of 4 turns, i.e., the coil of a phase, is formed. At this time, coil edge 33b of the 3rd coil 33 which extends from the 4th street of No. 67 of the slot number, and coil edge 34b of the 4th coil 34 which extends from the 4th street of No. 61 of the slot number become the lead wire (Oa) of the coil of a phase, and the neutral point (Na).

[0028] In the strand group in which similarly the slot group of No. 5 and ... of No. 11 No. 95 was looped around the

slot number as shown in drawing 5 Coil edge 31b of the 1st coil 31 which extends from the 2nd street of No. 59 of the slot number, and coil edge 33a of the 3rd coil 33 which extends from the 3rd street of No. 53 of the slot number cross, and are connected (contiguity address passage connection C2-3). subsequently Coil edge 32b of the 2nd coil 32 which extends from the 2nd street of No. 53 of the slot number, Coil edge 31a of the 1st coil 31 which coil edge 34a of the 4th coil 34 which extends from the 3rd street of No. 47 of the slot number crosses, is connected (contiguity address passage connection C2-3), and extends from the 1st street of No. 53 of the slot number further, Coil edge 32a of the 2nd coil 32 which extends from the 1st street of No. 47 of the slot number crosses, and is connected (the same address passage connection C1 -1). Thereby, the 1st or 4th coil 31-34 is connected in series, and the coil of b phase of 4 turns is formed. Moreover, coil edge 33b of the 3rd coil 33 which extends from the 4th street of No. 59 of the slot number, and coil edge 34b of the 4th coil 34 which extends from the 4th street of No. 53 of the slot number become the lead wire (Ob) of the coil of b phase, and the neutral point (Nb).

[0029] Furthermore, as shown in drawing 5, it sets in the strand group in which the slot group of No. 3 and ... of No. 9 No. 93 was looped around the slot number. Coil edge 32b of the 2nd coil 32 which extends from the 2nd street of No. 51 of the slot number, and coil edge 34a of the 4th coil 34 which extends from the 3rd street of No. 45 of the slot number cross, and are connected (contiguity address passage connection C2-3). subsequently Coil edge 31b of the 1st coil 31 which extends from the 2nd street of No. 45 of the slot number, Coil edge 32a of the 2nd coil 32 which coil edge 33a of the 3rd coil 33 which extends from the 3rd street of No. 39 of the slot number crosses, is connected (contiguity address passage connection C2-3), and extends from the 1st street of No. 45 of the slot number further, Coil edge 31a of the 1st coil 31 which extends from the 1st street of No. 39 of the slot number crosses, and is connected (the same address passage connection C1 -1). Thereby, the 1st or 4th coil 31-34 is connected in series, and the coil of c phase of 4 turns is formed. Moreover, coil edge 34b of the 4th coil 34 which extends from the 4th street of No. 51 of the slot number, and coil edge 33b of the 3rd coil 33 which extends from the 4th street of No. 45 of the slot number become the lead wire (Oc) of the coil of c phase, and the neutral point (Nc).

[0030] thus, in the coil of formed a phase, the coil of b phase, and the coil of c phase, each phase is the same -- a connection address is the 1st same street, and address passage connection C1-1 is prepared in eight slot pitches. Moreover, three lead wire Oa, Ob, and Oc is formed in eight slot pitches, and three median-line points Na, Nb, and Nc are also further formed in eight slot pitches.

[0031] Moreover, it sets in the strand group in which the slot group of No. 2 and ... of No. 8 No. 92 was looped around the slot number. In the strand group in which each strand 30 was connected similarly, the coil of a' phase was formed in, and the slot group of No. 6 and ... of No. 12 No. 96 was looped around the slot number. Each strand 30 is connected similarly, the coil of b' phase is formed, each strand 30 is similarly connected in the strand group in which the slot group of No. 4 and ... of No. 10 No. 94 was looped around the slot number, and the coil of c' phase is formed.

[0032] Subsequently, the same address passage connection and neutral point connection are explained. These same address passage connection and neutral point connection are performed using the terminal 100 for three-phase-circuit alternating current connection shown in drawing 6. The terminal 100 for three-phase-circuit alternating current connection consists of a metal terminal 101 for neutral point connection, and three metal terminals 102 for passage connection, as shown in drawing 6. The metal terminal 101 for neutral point connection bends metal rods, such as copper which has a rectangle cross section, processes them, and is produced, and piece of three junction 101a and one neutral point drawer lead 101b are prepared. And piece of junction 101a is prepared in the hoop direction by eight slot pitches corresponding to the three neutral points Na, Nb, and Nc. Moreover, in metal rods, such as copper which has a rectangle cross section, it bends in the shape of a KO character, and the metal terminal 102 for passage connection is produced so that it may have piece of junction 102a to ends. And three metal terminals 102 for passage connection are united with the metal terminal 101 for neutral point connection with the insulating resin 103 so that it may be arranged by the hoop direction by eight slot pitches.

[0033] And after making close the sides of coil edge 31b of the 1st coil 31, and coil edge 33a of the 3rd coil, The fused junction of the coil edges 31b and 33a is carried out by arc welding from the end side of a stator core 15. Moreover, after making close the sides of coil edge 32b of the 2nd coil 32, and coil edge 34a of the 4th coil, the fused junction of the coil edges 32b and 34a is carried out by arc welding from the end side of a stator core 15, and contiguity address passage connection of each phase is performed. Subsequently, the terminal 100 for three-phase-circuit alternating current connection is arranged to the end side of a stator core 15 so that the sides with the neutral points Na, Nb, and Nc of the coil of each piece of junction 101a, a phase, b phase, and c phase may be close, and the fused junction of each piece of junction 101a and the neutral points Na, Nb, and Nc is carried out by arc welding from the end side of a stator core 15. Moreover, the 1st of the coil of a phase and the sides of the coil edges 31a and 32a of the 2nd coil 31 and 32 and piece of junction 102a are made close, from the end side of a stator core 15, the fused junction of the coil edges 31a and 32a and the piece of junction 102a is carried out by arc welding, and the same address passage



connection is carried out. Similarly, the fused junction of the coil edges 31a and 32a of the 1st of the coil of b phase and c phase and 2nd coils 31 and 32 and the piece of junction 102a is carried out by arc welding, and the same address passage connection is carried out. Thereby, the three-phase-circuit line winding 160 which consists of a coil of a phase, b phase, and c phase is obtained. And the metal terminal 101 for neutral point connection connects electrically, and the neutral points Na, Nb, and Nc are summarized to one neutral point drawer lead 101b.

[0034] furthermore -- each -- junction -- a piece -- 101 -- a -- a -- ' -- a phase -- b -- ' -- a phase -- and -- c -- ' -- a phase -- a coil -- the neutral point -- Na -- ' -- Nb -- ' -- Nc -- ' -- the side -- comrades -- being close -- as -- a three phase circuit -- an alternating current -- connection -- \*\* -- a terminal -- 100 -- a stator core -- 15 -- an end -- a side -- arranging -- each -- junction -- a piece -- 101 Moreover, the 1st of the coil of a' phase and the sides of the coil edges 31a and 32a of the 2nd coil 31 and 32 and piece of junction 102a are made close, from the end side of a stator core 15, the fused junction of the coil edges 31a and 32a and the piece of junction 102a is carried out by arc welding, and the same address passage connection is carried out. Similarly, the fused junction of the coil edges 31a and 32a of the 1st of the coil of b'phase and c' phase and 2nd coils 31 and 32 and the piece of junction 102a is carried out by arc welding, and the same address passage connection is carried out. And the metal terminal 101 for neutral point connection connects electrically, and neutral point Na', Nb', and Nc' are summarized to one neutral point drawer lead 101b.

[0035] Thereby, as shown in [drawing 2](#) and [drawing 3](#), the stator 8 equipped with the stator winding 16 which consists of 2 sets of three-phase-circuit line windings 160 which carried out alternating current connection of the coil around which the stator core 15 was looped using the terminal 100 for three-phase-circuit alternating current connection is obtained. The three-phase-circuit line winding 160 of each class is star-type-connected so that the stator winding 161 for a three phase circuit may have the phase contrast of 120 degrees by the electrical angle mutually. Moreover, 2 sets of three-phase-circuit line windings 160 have the phase contrast of 30 degrees mutually, and the stator core 15 is looped around them. And 2 sets of three-phase-circuit line windings 160 are connected to the rectifier 12, respectively, as shown in [drawing 7](#). It connects in parallel and the dc output of each rectifier 12 is compounded. Moreover, the neutral point of the three phase each line winding 160 is connected to the dc-output terminal of a rectifier 12 through diode 29.

[0036] Here, each strand 30 which constitutes the 1st or 4th coil 31-34 extends from one slot 15a to the end-face side of a stator core 15, and the wave volume is looped around it so that it may be turned up and may go into 6 slot remote slot 15a. Every six slots, about the slot depth direction (the direction of a path), each strand 30 is looped around so that a inner layer and an external phase may be taken by turns. And by the electrical angle, the 1st coil 31 and the 2nd coil 32 shift 180 degrees, and reversal looping around is carried out. Similarly, by the electrical angle, the 3rd coil 33 and the 4th coil 34 shift 180 degrees, and reversal looping around is carried out. Moreover, turn section 30a of the strand 30 extended and turned up at the end-face side of a stator core 15 forms the coil end. then, turn section 30a mostly formed in the same configuration in the ends of a stator core 15 -- a hoop direction -- and it estranges mutually in the direction of a path, becomes two trains, is tidily arranged by the hoop direction, and a coil and Groups 16a and 16b are formed

[0037] Subsequently, it explains concretely, referring to [drawing 8](#) or [drawing 16](#) about the assembly method of a stator 8. First, as shown in [drawing 8](#), simultaneously, by the coplanar, the strand 30 of 12 long pictures is bent in the shape of thunder, and is formed. Subsequently, as shown to [drawing 9](#) by the arrow, it folds up and dies with a fixture in the right-angled direction, and the coil assemblies 90A and 90B shown in [drawing 10](#) and [drawing 11](#) are produced. In this folding process, it lets out and goes across the specific strand 30, and connection, lead wire, and the lead section of the neutral point are formed. Two or more parts which extend to one flank of the coil assemblies 90A and 90B are equivalent to the lead section among [drawing 10](#) and [drawing 11](#). In addition, the coil assemblies 90A and 90B are identically constituted except for passage connection, lead wire, and the lead section of the neutral point. And in order to make easy to fabricate annularly the iron core 36 equipped with the coil assemblies 90A and 90B, annealing processing of the coil assemblies 90A and 90B is carried out for 10 minutes at 300 degrees C after production. In addition, each strand 30 is bent and formed in the plane pattern with which bay 30b connected by turn section 30a was arranged by six slot pitches (6P) as shown in [drawing 12](#). and adjacent bay 30b -- turn section 30a -- width-of-face (of a strand 30 -- it is shifted by W) As two strands 30 formed in such a pattern are shown in [drawing 13](#), the strand pair arranged in piles shifts one slot pitch 6 slot-pitch staggering \*\*\*\*\* 30b at a time, and six pairs of coil assemblies 90 are arranged, and are constituted. And the edge of a strand 30 has extended six [ at a time ] on both sides of the ends of the coil assemblies 90A and 90B. Moreover, turn section 30a aligns in the both-sides section of the coil assemblies 90A and 90B, and is arranged. In addition, the strand pair arranged in piles in 6 slot-pitch staggering \*\*\*\*\* 30b as shown in [drawing 13](#) is shifted 180 degrees in the electrical angle. Moreover, as slot 36a of a trapezoid configuration carries out the predetermined number-of-sheets laminating of the SPCC material formed in the predetermined pitch (it is 30 degrees at an electrical angle), carries out laser welding of the periphery section and is shown in [drawing 14](#), the iron core 36 of a rectangular parallelepiped is produced.

[0038] And as shown in (a) of drawing 15, slot 36a of an iron core 36 is equipped with an insulator 19, and each bay of 2 sets of coil assemblies 90A and 90B is pushed in piles into each slot 36a. Thereby, as shown in (b) of drawing 15, an iron core 36 is equipped with 2 sets of coil assemblies 90A and 90B. At this time, it insulates with an iron core 36 with an insulator 19, and four bay 30b of a strand 30 is contained together with the direction of a path in slot 36a. Subsequently, an iron core 36 is rounded off, the end faces are made to contact and it welds, and as shown in drawing 15 (c), the cylinder-like iron core 37 is obtained. By rounding off an iron core 36, slot 36a (equivalent to slot 15a of a stator core) becomes an abbreviation rectangle cross-section configuration, and the opening 36b becomes smaller than the slot-width direction size of bay 30b. Then, as shown in drawing 16, after being inserted in the sheathing iron core 38 of the shape of a cylinder to which an iron core 37 carries out the laminating of the SPCC material and which it becomes, baked BAME is carried out and the stator core 15 with which the iron core 37 and the sheathing iron core 38 were united is obtained. And the edges of the same strand 30 are connected and the 1st or 4th coil 31-34 around which the same slot group was looped constitutes the coil of 1 turn, respectively. Subsequently, while each lead section of the coil assemblies 90A and 90B is cut, and carrying out the same address passage connection using the terminal 100 for alternating current connection after carrying out contiguity address passage connection as explained previously, the neutral point is connected and 2 sets of three-phase-circuit line windings 160 are obtained.

[0039] Thus, in the constituted AC generator for vehicles, current is supplied to the rotator coil 13 through a brush 10 and the slip ring 9 from a battery (not shown), and magnetic flux is generated. The presser-foot-stitch-tongue-like magnetic pole 22 of one field core 20 is magnetized by N pole, and the presser-foot-stitch-tongue-like magnetic pole 23 of the field core 21 of another side is magnetized by this magnetic flux at the south pole. On the other hand, the rotation torque of an engine is transmitted to a shaft 6 through a belt and a pulley 4, and a rotator 7 rotates. Then, rotating magnetic field are given to a stator winding 16, and electromotive force occurs in a stator winding 16. While the electromotive force of this alternating current is rectified by direct current through a rectifier 12, the size is adjusted by the regulator 18 and charged by the battery.

[0040] and the inhalation of air in which the open air countered the heat sink of a rectifier 12, and the heat sink 17 of a regulator 18, respectively, and was prepared by rotation of a fan 5 in rear \*\* -- a hole -- it absorbs through 2a, it flows in accordance with the shaft of a shaft 6, and a rectifier 12 and a regulator 18 are cooled, it is bent by the fan 5 in the centrifugal direction after that, the coil of rear \*\* of a stator winding 16 and group 16b are cooled, and it on the other hand -- a front side -- setting -- rotation of a fan 5 -- the open air -- inhalation of air -- shaft orientations absorb from hole 1a, it is bent by the fan 5 in the centrifugal direction after that, the coil by the side of the front of a stator winding 16 and group 16a are cooled, and it is discharged outside from exhaust hole 1b

[0041] Thus, according to the gestalt 1 of this operation, the stator winding 16 has two or more the 1st or 4th coils 31-34 with which it is looped around and one strand 30 becomes so that it may be turned up out of slot 15a by the side of the end face of a stator core 15 and an inner layer and an outer layer may be taken by turns in the slot depth direction within slot 15a every six slots. And the 1st volume track group constituted by arranging the 1st six coils 31 (the 3rd coil 33) by one slot pitch, 2 sets of coil assemblies 90A and 90B which consisted of pairs with the 2nd volume track group which consisted of electrical angles by arranging the 2nd six coils 32 (the 4th coil 34) by which reversal looping around was carried out by shifting 180 degrees by one slot pitch are used to the 1st coil 31 (the 3rd coil 33). And the stator core 15 is looped around 2 sets of coil assemblies 90A and 90B in two trains in the direction of a path.

[0042] Then, by looping a stator core 15 around the coil assemblies 90A and 90B in two trains, a stator core 15 will be looped around the stator winding 161 for six phases, and it can raise assembly nature remarkably. Moreover, since coil connection between [ 2 sets of ] coil assembly 90A and 90B is performed by two contiguity address passage connection (C2-3) and coil connection in [ 1 set of ] coil assembly 90A is performed by one same address passage connection (C1-1), the passage connection section serves as very simple structure. Thereby, the work of leading about of the strand 30 for passage connection, bending, etc. is mitigated remarkably, and connection workability improves sharply. Moreover, since the same address passage connection (C1-1) of each phase in the three-phase-circuit line winding 160 of each class is prepared in the hoop direction by eight slot pitches, while being able to arrange without contacting the same address passage connection of each phase and being able to improve connection workability, increase of the height of a coil end can be suppressed. moreover -- since the 1st or 4th coil 31-34 which constitutes a stator winding 16 is produced by one strand 30 (successive line), respectively -- the conventional stator 50 -- like -- many short length conductors -- a segment 54 can be inserted in a stator core 51, and it is not necessary to join edge 54b by welding, soldering, etc., and the productivity of a stator 8 can be raised remarkably Moreover, since a coil end consists of turn section 30a of a strand 30, the junction mosquito place in a coil and Groups 16a and 16b serves as only a joint of the edges of the 1st or 4th coil 31-34, and a passage connection joint, and a junction mosquito place is cut down remarkably. The high yield is obtained, while the outstanding insulation is acquired by this, since the occurrence of the short circuit accident accompanying disappearance of the insulating coat by junction is suppressed. Furthermore,

the fall of the corrosion resistance accompanying disappearance of the insulating coat by junction can be suppressed. [0043] Moreover, since the strand 30 is formed in the cross-section rectangle, the touch area of a joint can be enlarged, a big bonding strength is obtained, and reliability can be raised. Moreover, since it has joined by arc welding, a big bonding strength is obtained and reliability can be raised. Moreover, since the same address passage connection crosses and it is carried out using the metal terminal 102 for connection, the clamp which fixes the coil edges gone across and connected becomes unnecessary, and can cut down part mark. Moreover, the length of the coil edge crossed and connected can be shortened and leading about and bending work of a coil edge are mitigated remarkably. Moreover, since the neutral point of each phase is performed using the metal terminal 101 for neutral point connection, the clamp which fixes the coil edges which constitute the neutral point becomes unnecessary, and can cut down part mark. Moreover, the length of the coil edge which constitutes the neutral point can be shortened, and leading about and bending work of a coil edge are mitigated remarkably. Moreover, since neutral point drawer lead 101b is prepared in the metal terminal 101 for neutral point connection, it is not necessary to newly establish the lead which outputs the neutral point current of the three-phase-circuit line winding 160, and connection workability can be raised. moreover, neutral point connection -- public funds -- the terminal 101 made from a group -- crossing -- connection -- public funds -- since the terminal 102 made from a group is formed in one with the insulating resin 103, the process which arranges a terminal in the connection work of 1 set of three-phase-circuit line windings 160 becomes 1 time, and can cut down a work man day

[0044] moreover -- since 2 sets of coil assemblies 90A and 90B which consist of successive lines are arranged in two trains and it can insert in slot 15a of a stator core 15 -- many conductors -- compared with the conventional technology which inserts one segment 54 at a time in a slot, workability can be raised remarkably Moreover, when increasing the number of turns of a stator winding, it can respond easily by looping around in piles the coil assemblies 90A and 90B which consist of a successive line, as bay 30b is arranged face to face. Moreover, the stator 8 by the gestalt 1 of this operation inserts in slot 36a of the iron core 36 of a rectangular parallelepiped the coil assemblies 90A and 90B which consist of a successive line from opening 36b, after that, can round off an iron core 36 annularly, and can produce it. Then, since the opening size of opening 36b of an iron core 36 can be made larger than the slot-width method size of a strand 30, the insertion workability of a coil assembly can be raised. Moreover, since the opening size of opening 36b can be made smaller than the slot-width method size of a strand 30 by fabricating an iron core 36 annularly, a space factor is raised and an output can be raised. Furthermore, the productivity of a stator is not reduced even if the number of slots increases. further -- again -- a conductor -- since it is not necessary to push in in slot 15a in accordance with the shaft orientations of a stator core 15 like a segment 54, it is hard to generate the injury on the insulating coat of a strand 30, and the high yield can be realized

[0045] Thus, the effect acquired by carrying the constituted stator 8 in an AC generator is described below. First, since a coil end consists of turn section 30a of a strand 30, the junction mosquito place in a coil and Groups 16a and 16b is cut down remarkably. By this, there is no softening of the strand 30 by welding, the rigidity as a stator becomes high, and a magnetic noise can be reduced. Moreover, a coil and Groups 16a and 16b arrange turn section 30a to a hoop direction, and are constituted. thereby -- a conductor -- compared with the conventional coil and conventional group which have joined edge 54b of a segment 54, a coil and the extension height from the end face of the stator core 15 of a group can be made low Thereby, the draft resistance in a coil and Groups 16a and 16b can become small, and can reduce \*\*\*\* resulting from rotation of a rotator 7. Moreover, the leakage reactance of the coil of a coil end decreases and a power efficiency improves.

[0046] Moreover, four strands 30 are arranged in the direction of a path in slot 15a at one train, and turn section 30a is arranged by the hoop direction together with two trains. Since turn section 30a which constitutes a coil and Groups 16a and 16b is distributed by two trains in the direction of a path by this, respectively, a coil and the extension height from the end face of the stator core 15 of Groups 16a and 16b can be made low. Consequently, the draft resistance in a coil and Groups 16a and 16b can become small, and can reduce \*\*\*\* resulting from rotation of a rotator 7.

[0047] moreover, 30turn section 6 slot turned up by the end-face side of a stator core 15 -- \*\*\*\*\* -- two bays 30b arranged as a different layer in slot 15a is connected in series Since the coil of each phase and interference of a between are suppressed and high \*\*\*\*-ization of a stator winding is attained by this, a high increase in power is realized. Moreover, each turn section 30a can be easily formed in an abbreviation same configuration. And by forming each turn section 30a in an abbreviation same configuration, i.e., forming in an abbreviation same configuration turn section 30a which constitutes a coil and Groups 16a and 16b by the hoop direction, since the irregularity of the hoop direction in a coil and the bore side edge side of Groups 16a and 16b is stopped, the wind noise generated between a rotator 7, a coil, and Groups 16a and 16b can be reduced. Moreover, leakage inductance becomes equal and the stable output is obtained. moreover, turn section 30a -- a hoop direction -- estranging -- and the space between turn section 30a -- a hoop direction -- abbreviation -- since it is formed identically, while ventilation into coil and group 16a and

16b becomes easy and cooling nature is raised -- the style of cooling -- a coil -- and -- \*\* -- the noise by interference is reduced. Moreover, since each turn section 30a is formed in an abbreviation same configuration, aligns at a hoop direction and is arranged, the thermolysis nature in each turn section 30a becomes equivalent, and the thermolysis nature in a coil and Groups 16a and 16b becomes still more equivalent. Thereby, generation of heat by the stator winding 16 will radiate heat equally from each turn section 30a, and will radiate heat equally from both coils and Groups 16a and 16b further, and its cooling nature of a stator winding 16 improves.

[0048] Moreover, since the opening size of opening 15b of slot 15a is constituted smaller than the slot-width direction size of a strand 30, while the elutriation of the strand 30 from slot 15a to the direction inside of a path is prevented, interference sound with the rotator 7 in opening 15b is also reduced. Moreover, since bay 30b is formed in the rectangular section, when bay 30b is held in slot 15a, the cross-section configuration of bay 30b is the configuration where the slot configuration was met. While it becomes easy to raise the space factor of the strand 30 in slot 15a by this, the heat transfer from a strand 30 to a stator core 15 can be raised. Moreover, since the strand 30 is formed in the rectangular cross-section configuration, the heat sinking plane product from turn section 30b which constitutes a coil end becomes large, and generation of heat of a stator winding 16 radiates heat effectively. Furthermore, while being able to secure the crevice between turn section 30b and enabling ventilation of the cooling style into coil and group 16a and 16b by arranging the long side of the rectangular section to the direction of a path, and parallel, the draft resistance to the direction of a path can be reduced. Here, although bay 30b shall be formed in the rectangular section with the form 1 of this operation, the cross-section configurations of bay 30b should just be abbreviation flat configurations which made radii the shorter side of not only the rectangular section but a rectangle, such as an ellipse cross section and a prolate-ellipsoid cross section.

[0049] Moreover, the number of magnetic poles of a rotator 7 is formed by 16, and 96 slot 15a is formed by angular pitches [ stator core / 15 ]. That is, the number of slots in which a stator winding 16 is held has been equivalent to every \*\*\*\* enough, and is 2, since it has 2 sets of three-phase-circuit line windings 160 mutually arranged with phase contrast, near of the magnetomotive-force wave can be carried out to sinusoidal type, a harmonic content can be reduced, and the stable output can be obtained. Moreover, as shown in drawing 7, three stator windings 161 constituted by connecting the 1st or 4th coil 31-34 in series are star-type-connected at a time, 2 sets of three-phase-circuit line windings 160 are constituted, 2 sets of three-phase-circuit line windings 160 are connected to a rectifier 12, respectively, and the output of two more rectifiers 12 is connected in parallel. Thereby, the dc output of 2 sets of three-phase-circuit line windings 160 can be compounded and taken out, and the shortage of power generation in a low rotation region can be canceled. Moreover, since the neutral point (N) of the three-phase-circuit line winding 160 is connected to the output terminal of a rectifier 12 through diode 29, the output in the field of the rotational speed which exceeds 2000 - 2500rpm can be raised, using a big change of neutral point voltage effectively.

[0050] Moreover, a coil and Groups 16a and 16b have low height, and since there are also few joints, the interference sound between the cooling wind, coil, and Groups 16a and 16b which were formed by the fan 5 of rotation of a rotator 7 is small [ Groups ]. The configuration of both coils and Groups 16a and 16b spreads abbreviation etc., and since the fan 5 is formed in the both ends of a rotator 7, both coils and Groups 16a and 16b are cooled with sufficient balance, and stator winding temperature is reduced uniformly and greatly. Here, a fan 5 does not necessarily need to prepare in the ends of a rotator 7, and should just prepare in consideration of the arrangement position of a stator winding or a rectifier which is a big heating element. For example, it is good to arrange a fan in the edge of a near rotator at which the coil end of the stator winding which is the greatest heating element is arranged to the discharge side of a fan with a large cooling rate, and the rectifier is arranged. Moreover, since a pulley is usually connected with a crankshaft through a belt when attached in a vehicles engine, it is good to arrange a fan in an anti-pulley side so that a fan's cooling drainage wind may not influence a belt. In addition, the mold section of the presser-foot-stitch-tongue-like magnetic pole of a rotator also has a ventilation operation, and can be used as a cooling means.

[0051] Moreover, since the inclination direction of the strand 30 which constitutes the coil and inner circumference side of Groups 16a and 16b is parallel, the shaft-orientations flow within a case 3 circles along with the inclination of a strand 30. Thereby, the shaft-orientations flow produced by rotation of a rotator 7 is controlled. That is, if the strand 30 which constitutes the coil and inner circumference side of Groups 16a and 16b inclines in the synthetic direction of the hand-of-cut component of a rotator 7, and the shaft-orientations flow component of the cooling style, the shaft-orientations flow of the cooling style will be promoted. Thereby, since the rotator coil 13 is cooled efficiently, the temperature of the rotator coil 13 falls, field current becomes large, and improvement in an output can be desired. In this case, since the strand 30 which constitutes the coil and inner circumference side of Groups 16a and 16b inclines along with a shaft-orientations flow component, the wind noise by interference is also reduced. On the other hand, if the strand 30 which constitutes the coil and inner circumference side of Groups 16a and 16b inclines in the synthetic direction of the hand-of-cut component of a rotator 7, and the anti-shaft-orientations flow component of the cooling



style, the shaft-orientations flow of the cooling style will be reduced. Thereby, the air capacity of the discharge side of the direction of a path increases, and the cooling nature of the coil end arranged at the discharge side improves.

[0052] Moreover, since the shaft-orientations length of the stator 8 containing the coil end is smaller than the shaft-orientations length of field cores 20 and 21, a miniaturization is realizable. Moreover, while a draft resistance becomes remarkably small and a wind noise is reduced since there is no coil end in a fan discharge side when the fan 5 is formed in the both ends of a rotator 7, the temperature rise of the object with built-in cooling of rectifier 12 grade can be stopped.

[0053] In addition, although it shall cross with the metal terminal 101 for neutral point connection and the metal terminal 102 for connection shall be formed in one with the insulating resin 103 with the gestalt 1 of the above-mentioned implementation, both the terminals 101 and 102 do not necessarily need to be formed in one. In this case, although there is fault about the point that installation of a terminal increases, the same effect is acquired about other points. Moreover, with the gestalt 1 of the above-mentioned implementation, although the same address passage connection of each phase shall be arranged by eight slot pitches to the hoop direction, the same address passage connection of each phase can avoid mutual contact, if it arranges to a slot pitch  $4n$  or more. In addition,  $n$  is the number of slots enough which is equivalent to every \*\*\*\*.

[0054] The gestalt 2 of operation

Drawing 17 is the front view explaining the connection state for a three phase circuit of the stator winding in the AC generator for vehicles concerning the gestalt 2 of implementation of this invention. In the strand group in which the slot group of No. 1 and ... of No. 7 No. 91 was looped around the slot number in drawing 17 Coil edge 31b of the 1st coil 31 which extends from the 2nd street of No. 67 of the slot number, and coil edge 33a of the 3rd coil 33 which extends from the 3rd street of No. 61 of the slot number cross, and are connected (contiguity address passage connection C2-3). subsequently Coil edge 32b of the 2nd coil 32 which extends from the 2nd street of No. 61 of the slot number, Coil edge 31a of the 1st coil 31 which coil edge 34a of the 4th coil 34 which extends from the 3rd street of No. 55 of the slot number crosses, is connected (contiguity address passage connection C2-3), and extends from the 1st street of No. 61 of the slot number further, Coil edge 32a of the 2nd coil 32 which extends from the 1st street of No. 55 of the slot number crosses, and is connected (the same address passage connection C1 -1). Thereby, the 1st or 4th coil 31-34 is connected in series, and the stator winding 161 for one phase of 4 turns, i.e., the coil of a phase, is formed. At this time, coil edge 33b of the 3rd coil 33 which extends from the 4th street of No. 67 of the slot number, and coil edge 34b of the 4th coil 34 which extends from the 4th street of No. 61 of the slot number become the lead wire (Oa) of the coil of a phase, and the neutral point (Na).

[0055] In the strand group in which similarly the slot group of No. 3 and ... of No. 9 No. 93 was looped around the slot number Coil edge 32b of the 2nd coil 32 which extends from the 2nd street of No. 63 of the slot number, and coil edge 34a of the 4th coil 34 which extends from the 3rd street of No. 57 of the slot number cross, and are connected (contiguity address passage connection C2-3). subsequently Coil edge 31b of the 1st coil 31 which extends from the 2nd street of No. 57 of the slot number, Coil edge 34b of the 4th coil 34 which coil edge 33a of the 3rd coil 33 which extends from the 3rd street of No. 51 of the slot number crosses, is connected (contiguity address passage connection C2-3), and extends from the 4th street of No. 63 of the slot number further, Coil edge 33b of the 3rd coil 33 which extends from the 4th street of No. 57 of the slot number crosses, and is connected (the same address passage connection C4 -4). Thereby, the 1st or 4th coil 31-34 is connected in series, and the coil of b phase of 4 turns is formed. Moreover, coil edge 32a of the 2nd coil 32 which extends from the 1st street of No. 57 of the slot number, and coil edge 31a of the 1st coil 31 which extends from the 1st street of No. 51 of the slot number become the lead wire (Ob) of the coil of b phase, and the neutral point (Nb).

[0056] Furthermore, it sets in the strand group in which the slot group of No. 5 and ... of No. 11 No. 95 was looped around the slot number. Coil edge 31b of the 1st coil 31 which extends from the 2nd street of No. 59 of the slot number, and coil edge 33a of the 3rd coil 33 which extends from the 3rd street of No. 53 of the slot number cross, and are connected (contiguity address passage connection C2-3). subsequently Coil edge 32b of the 2nd coil 32 which extends from the 2nd street of No. 53 of the slot number, Coil edge 31a of the 1st coil 31 which coil edge 34a of the 4th coil 34 which extends from the 3rd street of No. 47 of the slot number crosses, is connected (contiguity address passage connection C2-3), and extends from the 1st street of No. 53 of the slot number further, Coil edge 32a of the 2nd coil 32 which extends from the 1st street of No. 47 of the slot number crosses, and is connected (the same address passage connection C1 -1). Thereby, the 1st or 4th coil 31-34 is connected in series, and the coil of c phase of 4 turns is formed. Moreover, coil edge 33b of the 3rd coil 33 which extends from the 4th street of No. 59 of the slot number, and coil edge 34b of the 4th coil 34 which extends from the 4th street of No. 53 of the slot number become the lead wire (Oc) of the coil of c phase, and the neutral point (Nc).

[0057] thus, it can set to the coil of formed a phase, and the coil of c phase -- the same -- there is a connection address



and address passage connection C1-1 can be set to the coil of b phase -- the same -- there are 4 connection addresses of address passage connection C4-4 And the lap of the same address passage connection of each phase is carried out in the slot depth direction, and it is prepared in it. Moreover, it is prepared in 10 slot pitches, and further, three median-line points Na, Nb, and Nc are also established in 10 slot pitches, and three lead wire Oa, Ob, and Oc has become a compact from the gestalt 1 of operation.

[0058] Moreover, it sets in the strand group in which the slot group of No. 2 and ... of No. 8 No. 92 was looped around the slot number. In the strand group in which each strand 30 was connected similarly, the coil of a' phase was formed in, and the slot group of No. 4 and ... of No. 10 No. 94 was looped around the slot number Each strand 30 is connected similarly, the coil of b' phase is formed, each strand 30 is similarly connected in the strand group in which the slot group of No. 6 and ... of No. 12 No. 96 was looped around the slot number, and the coil of c' phase is formed. In addition, other composition is constituted like the gestalt 1 of the above-mentioned implementation.

[0059] Since according to the gestalt 2 of this operation the same address passage connection of each phase of a three-phase-circuit line winding is performed by address which is different by the adjoining interphase and is arranged by four slot pitches, while being able to improve connection workability, increase of the height of a coil end can be suppressed. Moreover, since the same address passage connection is arranged by four slot pitches, a connection working area can be concentrated compared with the gestalt 1 of the above-mentioned implementation, and connection workability can be improved.

[0060] In addition, with the gestalt 2 of the above-mentioned implementation, although the same address passage connection of each phase shall be arranged by four slot pitches to the hoop direction, if an address which is different by the adjacent interphase performs the same address passage connection and the same address passage connection of each phase is arranged to a slot pitch  $2n$  or more, mutual contact is avoidable. In addition,  $n$  is the number of slots enough which is equivalent to every \*\*\*\*.

[0061] The gestalt 3 of operation

Drawing 18 is the front view explaining the connection state for a three phase circuit of the stator winding in the AC generator for vehicles concerning the gestalt 3 of implementation of this invention. In the strand group in which the slot group of No. 1 and ... of No. 7 No. 91 was looped around the slot number in drawing 18 Coil edge 31b of the 1st coil 31 which extends from the 2nd street of No. 67 of the slot number, and coil edge 33a of the 3rd coil 33 which extends from the 3rd street of No. 61 of the slot number cross, and are connected (contiguity address passage connection C2-3). subsequently Coil edge 33b of the 3rd coil 33 which extends from the 4th street of No. 67 of the slot number, Coil edge 31a of the 1st coil 31 which coil edge 34b of the 4th coil 34 which extends from the 4th street of No. 61 of the slot number crosses, is connected (the same address passage connection C4 -4), and extends from the 1st street of No. 61 of the slot number further, Coil edge 32a of the 2nd coil 32 which extends from the 1st street of No. 55 of the slot number crosses, and is connected (the same address passage connection C1 -1). Thereby, the 1st or 4th coil 31-34 is connected in series, and the stator winding 161 for one phase of 4 turns, i.e., the coil of a phase, is formed. At this time, coil edge 32b of the 2nd coil 32 which extends from the 2nd street of No. 61 of the slot number, and coil edge 34a of the 4th coil 34 which extends from the 3rd street of No. 55 of the slot number become the lead wire (Oa) of the coil of a phase, and the neutral point (Na).

[0062] In the strand group in which similarly the slot group of No. 5 and ... of No. 11 No. 95 was looped around the slot number Coil edge 31b of the 1st coil 31 which extends from the 2nd street of No. 59 of the slot number, and coil edge 33a of the 3rd coil 33 which extends from the 3rd street of No. 53 of the slot number cross, and are connected (contiguity address passage connection C2-3). subsequently Coil edge 33b of the 3rd coil 33 which extends from the 4th street of No. 59 of the slot number, Coil edge 31a of the 1st coil 31 which coil edge 34b of the 4th coil 34 which extends from the 4th street of No. 53 of the slot number crosses, is connected (the same address passage connection C4 -4), and extends from the 1st street of No. 53 of the slot number further, Coil edge 32a of the 2nd coil 32 which extends from the 1st street of No. 47 of the slot number crosses, and is connected (the same address passage connection C1 -1). Thereby, the 1st or 4th coil 31-34 is connected in series, and the coil of b phase of 4 turns is formed. Moreover, coil edge 32b of the 2nd coil 32 which extends from the 2nd street of No. 53 of the slot number, and coil edge 34a of the 4th coil 34 which extends from the 3rd street of No. 47 of the slot number become the lead wire (Ob) of the coil of b phase, and the neutral point (Nb).

[0063] Furthermore, it sets in the strand group in which the slot group of No. 3 and ... of No. 9 No. 93 was looped around the slot number. Coil edge 32b of the 2nd coil 32 which extends from the 2nd street of No. 51 of the slot number, and coil edge 34a of the 4th coil 34 which extends from the 3rd street of No. 45 of the slot number cross, and are connected (contiguity address passage connection C2-3). subsequently Coil edge 34b of the 4th coil 34 which extends from the 4th street of No. 51 of the slot number, Coil edge 32a of the 2nd coil 32 which coil edge 33b of the 3rd coil 33 which extends from the 4th street of No. 45 of the slot number crosses, is connected (the same address

passage connection C4 -4), and extends from the 1st street of No. 45 of the slot number further, Coil edge 31a of the 1st coil 31 which extends from the 1st street of No. 39 of the slot number crosses, and is connected (the same address passage connection C1 -1). Thereby, the 1st or 4th coil 31-34 is connected in series, and the coil of c phase of 4 turns is formed. Moreover, coil edge 31b of the 1st coil 31 which extends from the 2nd street of No. 45 of the slot number, and coil edge 33a of the 3rd coil 33 which extends from the 3rd street of No. 39 of the slot number become the lead wire (Oc) of the coil of c phase, and the neutral point (Nc).

[0064] thus -- the coil of formed a phase, the coil of b phase, and the coil of c phase -- two same address passage connection C per each phase -- it has 1-1 and C4-4 and each phase is the same -- address passage connection C1-1 is prepared in eight slot pitches, and, as for each phase, it is the same -- address passage connection C4-4 are prepared in eight slot pitches. Moreover, three lead wire Oa, Ob, and Oc is formed in eight slot pitches, and three median-line points Na, Nb, and Nc are also further formed in eight slot pitches.

[0065] Moreover, it sets in the strand group in which the slot group of No. 2 and ... of No. 8 No. 92 was looped around the slot number. In the strand group in which each strand 30 was connected similarly, the coil of a' phase was formed in, and the slot group of No. 6 and ... of No. 12 No. 96 was looped around the slot number. Each strand 30 is connected similarly, the coil of b' phase is formed, each strand 30 is similarly connected in the strand group in which the slot group of No. 4 and ... of No. 10 No. 94 was looped around the slot number, and the coil of c' phase is formed. In addition, other composition is constituted like the gestalt 1 of the above-mentioned implementation.

[0066] Therefore, also in the gestalt 3 of this operation, since the same address passage connection of each phase of a three-phase-circuit line winding is arranged by eight slot pitches, it can arrange, without contacting the same address passage connection.

[0067] Gestalt 4. drawing 19 of operation is the plan showing the connection state for one phase of the stator winding in the AC generator for vehicles concerning the gestalt 4 of implementation of this invention. In drawing 19, stator winding 161A for one phase consists of the 1st or 6th coil 31-36 which consists of one strand 30, respectively. And a wave volume is carried out and it is constituted so that the 1st coil 31 may take one strand 30 and may take the 1st street [ 2nd ] in slot 15a by turns every six slots from No. 1 of the slot number to No. 91. A wave volume is carried out and it is constituted so that the 2nd coil 32 may take a strand 30 and may take the 2nd street [ 1st ] in slot 15a by turns every six slots from No. 1 of the slot number to No. 91. A wave volume is carried out and it is constituted so that the 3rd coil 33 may take a strand 30 and may take the 3rd street [ 4th ] in slot 15a by turns every six slots from No. 1 of the slot number to No. 91. A wave volume is carried out and it is constituted so that the 4th coil 34 may take a strand 30 and may take the 4th street [ 3rd ] in slot 15a by turns every six slots from No. 1 of the slot number to No. 91. A wave volume is carried out and it is constituted so that the 5th coil 35 may take a strand 30 and may take the 5th street [ 6th ] in slot 15a by turns every six slots from No. 1 of the slot number to No. 91. A wave volume is carried out and it is constituted so that the 6th coil 36 may take a strand 30 and may take the 6th street [ 5th ] in slot 15a by turns every six slots from No. 1 of the slot number to No. 91. Thereby, the 1st or 6th coil 31-36 constitutes the coil of 1 turn which is looped around and becomes so that may be taken one strand 30 in the slot depth direction within slot 15a and an inner layer and an outer layer may be taken by turns every six slots, respectively.

[0068] And coil edge 31b of the 1st coil 31 which extends from the 2nd street of No. 67 of the slot number to the end side of a stator core 15, Coil edge 33b of the 3rd coil 33 which coil edge 33a of the 3rd coil 33 which extends from the 3rd street of No. 61 of the slot number crosses, is connected (contiguity address passage connection C2-3), and extends from the 4th street of No. 67 of the slot number, Coil edge 35a of the 5th coil 35 which extends from the 5th street of No. 61 of the slot number crosses, and is connected (contiguity address passage connection C4-5). subsequently Coil edge 32b of the 2nd coil 32 which extends from the 2nd street of No. 61 of the slot number, Coil edge 34b of the 4th coil 34 which coil edge 34a of the 4th coil 34 which extends from the 3rd street of No. 55 of the slot number crosses, is connected (contiguity address passage connection C2-3), and extends from the 4th street of No. 61 of the slot number, Coil edge 31a of the 1st coil 31 which coil edge 36a of the 6th coil 36 which extends from the 5th street of No. 55 of the slot number crosses, is connected (contiguity address passage connection C4-5), and extends from the 1st street of No. 61 of the slot number further, Coil edge 32a of the 2nd coil 32 which extends from the 1st street of No. 55 of the slot number crosses, and is connected (the same address passage connection C1 -1). Thereby, the 1st or 6th coil 31-36 is connected in series, and the coil of stator winding 161A for one phase of 6 turns, i.e., a phase, is formed. At this time, coil edge 35b of the 5th coil 35 which extends from the 6th street of No. 67 of the slot number, and coil edge 36b of the 6th coil 36 which extends from the 6th street of No. 61 of the slot number become the lead wire (Oa) of stator winding 161A, and the neutral point (Na).

[0069] In the strand group in which similarly the slot group of No. 5 and ... of No. 11 No. 95 was looped around the slot number Coil edge 31b of the 1st coil 31 which extends from the 2nd street of No. 59 of the slot number as shown in drawing 20, Coil edge 33b of the 3rd coil 33 which coil edge 33a of the 3rd coil 33 which extends from the 3rd

street of No. 53 of the slot number crosses, is connected (contiguity address passage connection C2-3), and extends from the 4th street of No. 59 of the slot number, Coil edge 35a of the 5th coil 35 which extends from the 5th street of No. 53 of the slot number crosses, and is connected (contiguity address passage connection C4-5). subsequently Coil edge 32b of the 2nd coil 32 which extends from the 2nd street of No. 53 of the slot number, Coil edge 34b of the 4th coil 34 which coil edge 34a of the 4th coil 34 which extends from the 3rd street of No. 47 of the slot number crosses, is connected (contiguity address passage connection C2-3), and extends from the 4th street of No. 53 of the slot number, Coil edge 31a of the 1st coil 31 which coil edge 36a of the 6th coil 36 which extends from the 5th street of No. 47 of the slot number crosses, is connected (contiguity address passage connection C4-5), and extends from the 1st street of No. 53 of the slot number further, Coil edge 32a of the 2nd coil 32 which extends from the 1st street of No. 47 of the slot number crosses, and is connected (the same address passage connection C1 -1). Thereby, the 1st or 6th coil 31-36 is connected in series, and the coil of b phase of 6 turns is formed. At this time, coil edge 35b of the 5th coil 35 which extends from the 6th street of No. 59 of the slot number, and coil edge 36b of the 6th coil 36 which extends from the 6th street of No. 53 of the slot number become the lead wire (Ob) of the coil of b phase, and the neutral point (Nb).

[0070] Furthermore, it sets in the strand group in which the slot group of No. 3 and ... of No. 9 No. 93 was looped around the slot number. Coil edge 32b of the 2nd coil 32 which extends from the 2nd street of No. 51 of the slot number as shown in drawing 20 , Coil edge 34b of the 4th coil 34 which coil edge 34a of the 4th coil 34 which extends from the 3rd street of No. 45 of the slot number crosses, is connected (contiguity address passage connection C2-3), and extends from the 4th street of No. 51 of the slot number, Coil edge 36a of the 6th coil 36 which extends from the 5th street of No. 45 of the slot number crosses, and is connected (contiguity address passage connection C4-5). subsequently Coil edge 31b of the 1st coil 31 which extends from the 2nd street of No. 45 of the slot number, Coil edge 33b of the 3rd coil 33 which coil edge 33a of the 3rd coil 33 which extends from the 3rd street of No. 39 of the slot number crosses, is connected (contiguity address passage connection C2-3), and extends from the 4th street of No. 45 of the slot number, Coil edge 32a of the 2nd coil 32 which coil edge 35a of the 5th coil 35 which extends from the 5th street of No. 39 of the slot number crosses, is connected (contiguity address passage connection C4-5), and extends from the 1st street of No. 45 of the slot number further, Coil edge 31a of the 1st coil 31 which extends from the 1st street of No. 39 of the slot number crosses, and is connected (the same address passage connection C1 -1). Thereby, the 1st or 6th coil 31-36 is connected in series, and the coil of c phase of 6 turns is formed. At this time, coil edge 36b of the 6th coil 36 which extends from the 6th street of No. 51 of the slot number, and coil edge 35b of the 5th coil 35 which extends from the 6th street of No. 45 of the slot number become the lead wire (Oc) of the coil of c phase, and the neutral point (Nc).

[0071] Moreover, it sets in the strand group in which the slot group of No. 2 and ... of No. 8 No. 92 was looped around the slot number. In the strand group in which each strand 30 was connected similarly, the coil of a' phase was formed in, and the slot group of No. 6 and ... of No. 12 No. 96 was looped around the slot number Each strand 30 is connected similarly, the coil of b' phase is formed, each strand 30 is similarly connected in the strand group in which the slot group of No. 4 and ... of No. 10 No. 94 was looped around the slot number, and the coil of c' phase is formed. In addition, other composition is constituted like the gestalt 1 of the above-mentioned implementation.

[0072] With the gestalt 4 of this operation, the stator core 15 is looped around 2 sets of coil assembly 90A and 1 set of coil assembly 90B in three trains in the direction of a path. And between the coils in [ 1 set of ] coil assembly 90A is connected by one same address passage connection (C1-1), between the coils between coil assembly 90A which adjoin by four contiguity address passage connection (C2-3, C4-5), and between coil assembly 90A and 90B is connected, and stator winding 161A for one phase of 6 turns is formed. And the same address passage connection (C1-1) of each phase of a three-phase-circuit line winding is arranged by eight slot pitches. Then, also in the gestalt 4 of this operation, the same effect as the gestalt 1 of the above-mentioned implementation is acquired.

[0073] Gestalt 5. drawing 21 of operation is the perspective diagram showing the stator of the AC generator for vehicles concerning the gestalt 5 of implementation of this invention. In drawing 21 , the mould of the coil end of a stator winding is carried out by the insulating resins 104, such as an epoxy resin, and each joint of a coil is laid underground by the insulating resin 104. In addition, other composition is constituted like the gestalt 1 of the above-mentioned implementation.

[0074] According to the gestalt 5 of this operation, the joint of the edges of the 1st or 4th coil 31-34, the contiguity address passage connection section and the same address passage connection section, and the blank of the joint by vibration since terminals 101 and 102 are further laid underground with the insulating resin 104, while insulation improves are prevented, and reliability improves.

[0075] In addition, with the gestalt of each above-mentioned implementation, although the fan 5 shall be arranged in a case 3, a fan may prepare so that it may follow with rotation of a rotator out of the AC generator for vehicles and may rotate. Moreover, although the gestalt of each above-mentioned implementation explains the thing of six turns, four

turns, and 2 turns, when a low-speed output is required further, it is good also as eight turns. Even in this case, it can respond only by arranging the coil assembly 90 in four trains in the direction of a path, and inserting in a stator core 15. Of course, the odd numbers of turns are sufficient. Moreover, with the gestalt of each above-mentioned implementation, a rotator coil is fixed to a bracket and it can apply also to the AC generator for vehicles of the type which supplies a rotating excitation field from an air gap. Moreover, with the gestalt of each above-mentioned implementation, although the number of slots of a stator was used as 96 slots to the number of magnetic poles of 16 poles, to the number of magnetic poles of 12 poles, you may adopt the slot of 120 to the number of magnetic poles of 72 slots and 20 poles by the three phase circuit. Moreover, in \*\*\*\*\* 1, it is [ in the number of magnetic poles of 16 poles ] good [ at 36 slots and the number of magnetic poles of 20 poles ] in 60 slots in 48 slots and the number of magnetic poles of 12 poles. Moreover, although the periphery iron core of a stator core is constituted from a gestalt of each above-mentioned implementation as a layered product of SPCC material, a sheathing iron core may use the thing of the pipe configuration which is really an object. Moreover, after inserting a coil group in the slot of the iron core of a rectangular parallelepiped, a processing fixture is pressed, a teeth nose of cam may be made to deform plastically from a path, and opening of a slot may be narrowed.

[0076] Moreover, although the Laon Dell type rotator with a presser-foot-stitch-tongue-like magnetic pole shall be used with the gestalt of each above-mentioned implementation, the same effect is acquired even if it uses a SERENTO type rotator with a salient pole type magnetic pole. Moreover, although a rectifier is arranged at an anti-pulley side and the fan is also stationed to the rotator with the gestalt of each above-mentioned implementation at the same side, you may station a fan to a pulley side. When there is no problem especially in the temperature of a rectifier, you may station a fan to an anti-pulley side. Since the draft resistance of the discharge side in a fan's ventilation flue is decreasing remarkably to the low sake, the height of whole air capacity of the coil end of a stator increases. Therefore, the physical relationship of a rectifier, a pulley, and a fan should just choose the optimal position in view of the installation position of an engine, a wind noise and a magnetic noise, and the temperature state of each part. Moreover, although a strand is made to estrange and it is made to form a coil with the gestalt of each above-mentioned implementation, since the strand has the insulating coat, it may fabricate a coil so that a strand may be completely made close. According to this composition, the densification of the coil end can be carried out further, and a size can be made still smaller. Moreover, since irregularity decreases by making the crevice between strands small, a wind noise can be reduced further. Moreover, by contact between strands, since the rigidity of a coil becomes high, a short circuit between the strands by vibration and with an iron core and a further can reduce a magnetic noise. Moreover, since the thermal conductivity between strands becomes good, the temperature of a strand becomes uniform and the temperature of a stator is reduced further. Moreover, although the insulator is beforehand inserted in an iron core side at the time of insertion to the stator core of a strand group, an insulator is beforehand twisted around the slot hold section of a strand group, and you may make it insert in an iron core with the gestalt of each above-mentioned implementation. Moreover, as a long insulator is laid on the iron core of a rectangular parallelepiped and a strand group is inserted from on the, you may make it also hold an insulator in a slot simultaneously. In this case, what is necessary is just to carry out package removal of the projected insulator at a back process. Furthermore, you may carry out the mould of the slot hold section of a strand group by the insulating resin beforehand. in this case, mass-production nature is markedly alike and improves Moreover, although it shall unify by baked BAME with the gestalt of each above-mentioned implementation after inserting in a sheathing iron core the annular iron core which rounded off and produced the iron core of a rectangular parallelepiped, the annular iron core which rounded off and produced the iron core of a rectangular parallelepiped is pressed fit in a sheathing iron core, and you may make it unify.

[0077]  
[Effect of the Invention] Since this invention is constituted as mentioned above, it does so an effect which is indicated below.

[0078] The stator core of the shape of a cylinder which the slot prolonged in shaft orientations becomes from the layer-built iron core formed in the hoop direction in the predetermined pitch according to this invention, [ two or more ] The long strand which consists of a successive line is turned up out of the above-mentioned slot by the side of the end face of the above-mentioned stator core. It has the stator winding which consists of two or more coils which are looped around and become so that a inner layer and an outer layer may be taken by turns in the slot depth direction within the above-mentioned slot for every number of predetermined slots. two or more above-mentioned coils It consists of at least 1 set of coil assemblies which folded up two or more above-mentioned strands simultaneously, and were formed. the above-mentioned coil assembly A bay is connected by the turn section and arranged by the predetermined slot pitch. And the two above-mentioned strands formed in the pattern shifted so that this adjacent bay might take a inner layer and an outer layer by turns in the slot depth direction by this turn section The strand pair which comes to arrange the above-mentioned predetermined slot pitch staggering \*\*\*\*\* bay in piles mutually One slot pitch is shifted at a

time, and a same number pair array is carried out with the above-mentioned number of predetermined slots, and it is constituted. the above-mentioned coil assembly The 1st volume track group which comes to arrange the 1st coil of 1 turn constituted by looping around so that the above-mentioned stator core was equipped, and might be taken the above-mentioned strand in the slot depth direction within the above-mentioned slot and a inner layer and an outer layer might be taken by turns for every above-mentioned number of predetermined slots by one slot pitch by the same number as the above-mentioned number of predetermined slots, So that may be taken the above-mentioned strand in the slot depth direction within the above-mentioned slot and a inner layer and an outer layer may be taken by turns for every number of predetermined slots And the 2nd coil of 1 turn which consisted of the 1st coil of the above and an electrical angle by shifting 180 degrees and carrying out reversal looping around constitutes a pair with the 2nd volume track group which it comes to arrange by the same number as the above-mentioned number of predetermined slots from one slot pitch. The above-mentioned stator winding is constituted by the three-phase-circuit line winding in which each phase which has the slot of  $n$  \*\*\*\*\* has phase contrast 120 degrees by the electrical angle. The 1st coil of the above and the 2nd coil of the above which constitute the same phase in the above-mentioned coil assembly are connected by the same address passage connection at the same address, respectively, and the same above-mentioned address passage connection of each phase is arranged by the slot pitch  $4n$  or more. While the junction mosquito place in a coil end is reduced remarkably and a corrosion resistance and insulation are raised by this, two or more coils are put in block as a coil assembly, a stator core can be looped around, and assembly nature and productivity are raised. Furthermore, it can arrange to a hoop direction, without contacting the same address passage connection of each phase, and increase of the height of a coil end can be suppressed.

[0079] Moreover, the stator core of the shape of a cylinder which the slot prolonged in shaft orientations becomes from the layer-built iron core formed in the hoop direction in the predetermined pitch, [ two or more ] The strand which consists of a successive line is turned up out of the above-mentioned slot by the side of the end face of the above-mentioned stator core. It has the stator winding which consists of two or more coils which are looped around and become so that a inner layer and an outer layer may be taken by turns in the slot depth direction within the above-mentioned slot for every number of predetermined slots. two or more above-mentioned coils It consists of at least 1 set of coil assemblies which folded up two or more above-mentioned strands simultaneously, and were formed. the above-mentioned coil assembly A bay is connected by the turn section and arranged by the predetermined slot pitch. And the two above-mentioned strands formed in the pattern shifted so that this adjacent bay might take a inner layer and an outer layer by turns in the slot depth direction by this turn section The strand pair which comes to arrange the above-mentioned predetermined slot pitch staggering \*\*\*\*\* bay in piles mutually One slot pitch is shifted at a time, and a same number pair array is carried out with the above-mentioned number of predetermined slots, and it is constituted. the above-mentioned coil assembly The 1st volume track group which comes to arrange the 1st coil of 1 turn constituted by looping around so that the above-mentioned stator core was equipped, and might be taken the above-mentioned strand in the slot depth direction within the above-mentioned slot and a inner layer and an outer layer might be taken by turns for every above-mentioned number of predetermined slots by one slot pitch by the same number as the above-mentioned number of predetermined slots, So that may be taken the above-mentioned strand in the slot depth direction within the above-mentioned slot and a inner layer and an outer layer may be taken by turns for every number of predetermined slots And the 2nd coil of 1 turn which consisted of the 1st coil of the above and an electrical angle by shifting 180 degrees and carrying out reversal looping around constitutes a pair with the 2nd volume track group which it comes to arrange by the same number as the above-mentioned number of predetermined slots from one slot pitch. The above-mentioned stator winding is constituted by the three-phase-circuit line winding in which each phase which has the slot of  $n$  \*\*\*\*\* has phase contrast 120 degrees by the electrical angle. It is connected by the same address passage connection at an address which is different by the interphase which the 1st coil of the above which constitutes the same phase in the above-mentioned coil assembly, and the 2nd coil of the above adjoin, and the same above-mentioned address passage connection of each phase is arranged by the slot pitch  $2n$  or more. While the junction mosquito place in a coil end is reduced remarkably and a corrosion resistance and insulation are raised by this, two or more coils are put in block as a coil assembly, a stator core can be looped around, and assembly nature and productivity are raised. Furthermore, it can arrange to a hoop direction, without contacting the same address passage connection of each phase, and increase of the height of a coil end can be suppressed. Arrangement of the same address passage connection of each phase can be concentrated, and connection workability can be raised further again.

[0080] Moreover, since the coil in the same coil group of the above-mentioned 1st volume track group or the above-mentioned 2nd volume track group which consists of two or more sets of above-mentioned coil assemblies, and constitutes the same phase in two or more sets of above-mentioned coil assemblies crosses and is connected at the contiguity address, leading about of the strand for passage connection and the work of bending are mitigated remarkably, and connection workability of two or more above-mentioned coils improves. Moreover, since the above-



mentioned stator core is looped around 2 sets of above-mentioned coil assemblies in the direction of a path together with two trains, each phase which constitutes the above-mentioned three-phase-circuit line winding connects in series the above 1st and the 2nd coil around which the same slot group was looped and it is constituted by the coil of 4 turns, the three-phase-circuit line winding which consists of a coil of each phase 4 turn can be constituted simply.

[0081] Moreover, as for each phase of the above-mentioned three-phase-circuit line winding, the above 1st between 2 sets of above-mentioned coil assemblies and the coil edge of the 2nd coil are connected by two contiguity address passage connection. And since the above 1st in the above-mentioned coil assembly of one group and the coil edge of the 2nd coil are connected by one same address passage connection and constituted by the coil of 4 turns, the passage connection section can serve as simple structure, and can raise connection workability.

[0082] Moreover, as for each phase of the above-mentioned three-phase-circuit line winding, the above 1st in the above-mentioned coil assembly of each class and the coil edge of the 2nd coil are connected by one same address passage connection, respectively. And since the above 1st between 2 sets of above-mentioned coil assemblies and the coil edge of the 2nd coil are connected by one contiguity address passage connection and constituted by the coil of 4 turns, the passage connection section can serve as simple structure, and can raise connection workability.

[0083] Moreover, since the above-mentioned stator core is looped around 3 sets of above-mentioned coil assemblies in the direction of a path together with three trains, each phase which constitutes the above-mentioned three-phase-circuit line winding connects in series the above 1st and the 2nd coil around which the same slot group was looped and it is constituted by the coil of 6 turns, the three-phase-circuit line winding which consists of a coil of each phase 6 turn can be constituted simply.

[0084] Moreover, since the same above-mentioned address passage connection crosses and it is carried out using the metal terminal for connection, while the clamp which fixes the coil edges to connect becomes unnecessary and can cut down part mark, the length of the coil edge to connect becomes short and leading about and bending work of a coil edge are mitigated.

[0085] Moreover, since the coil edge which constitutes the neutral point of the above-mentioned three-phase-circuit line winding is connected using the metal terminal for neutral point connection, while the clamp which fixes the coil edges to connect becomes unnecessary and can cut down part mark, the length of the coil edge to connect becomes short and leading about and bending work of a coil edge are mitigated.

[0086] Moreover, since the neutral point drawer lead is formed in the above-mentioned metal terminal for neutral point connection at one, it is not necessary to newly establish the lead which outputs the neutral point current of a three-phase-circuit line winding, and connection workability can be raised.

[0087] Moreover, since the above-mentioned metal terminal for passage connection and the above-mentioned metal terminal for neutral point connection are unified with the insulating resin, the arrangement process of the terminal in alternating current connection work is 1 time, can end, and can cut down a work man day.

[0088] Moreover, since connection of the above 1st and the 2nd coil is performed by arc welding, a big bonding strength is obtained and reliability can be raised.

[0089] Moreover, since the cross-section configuration of the above-mentioned strand is an abbreviation flat configuration, the touch area of a joint can be enlarged and a bonding strength can be raised.

[0090] Moreover, since the mould of the coil end of the above-mentioned stator winding is carried out with the insulating resin, while a joint is laid under the insulating resin and a corrosion resistance and insulation are raised, the blank of the joint resulting from vibration can be prevented.

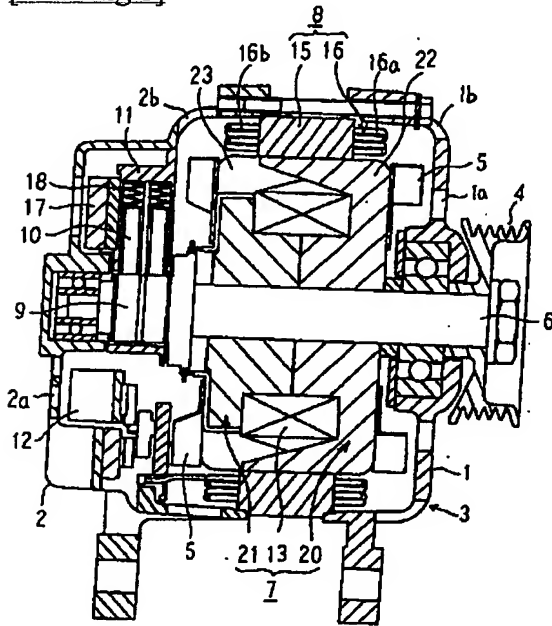
**\* NOTICES \***

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- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

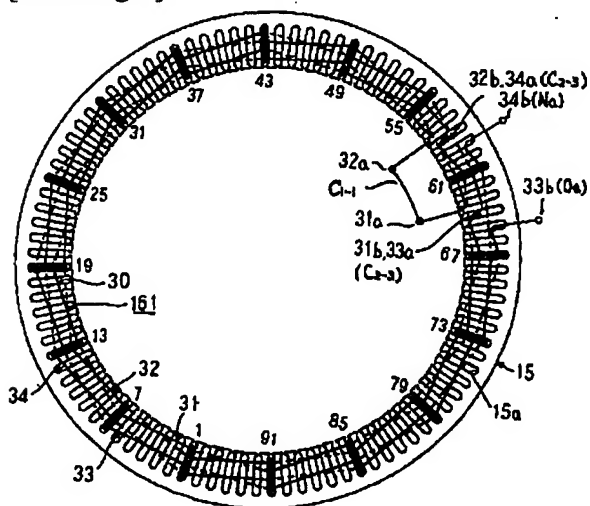
## DRAWINGS

[Drawing 1]



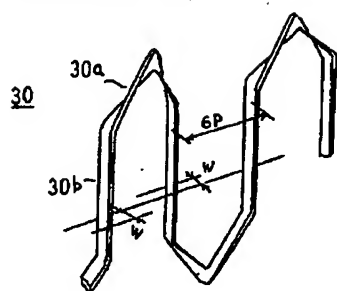
8 : 固定子  
15 : 固定子鉄心  
16 : 固定子巻線

[Drawing 4]

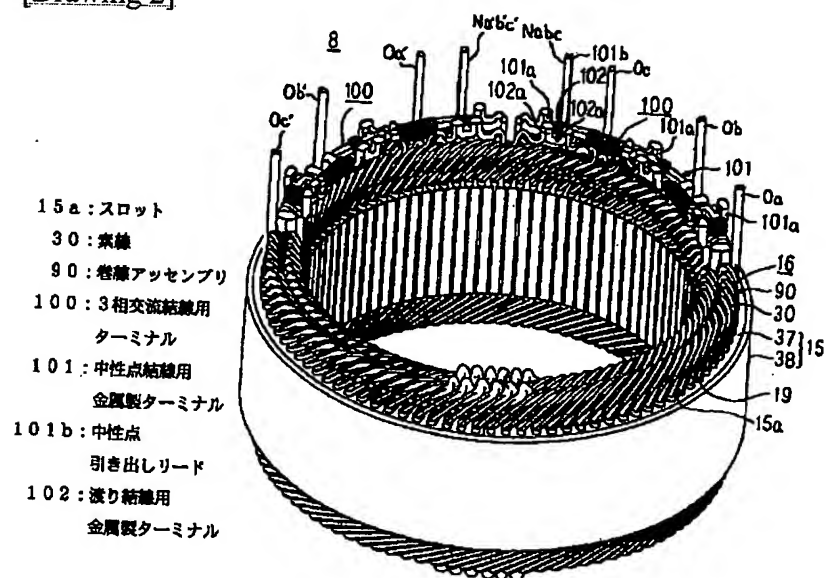


31: 第1巻線      32: 第3 線  
32: 第2巻線      34: 第4巻線

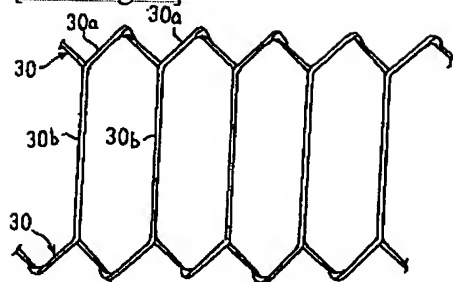
[Drawing 12]



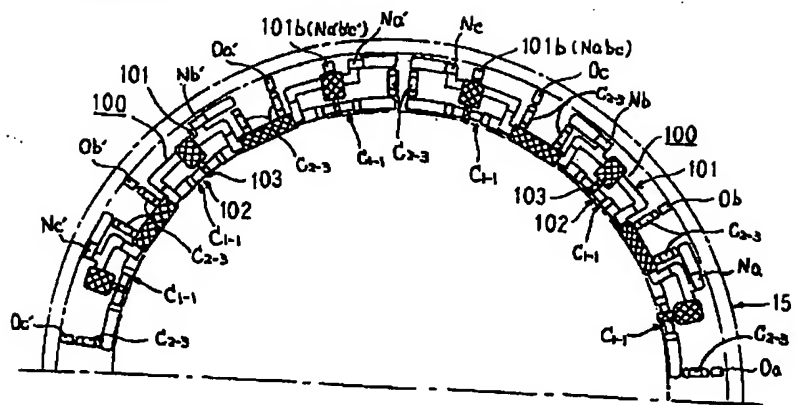
[Drawing 2]



[Drawing 13]

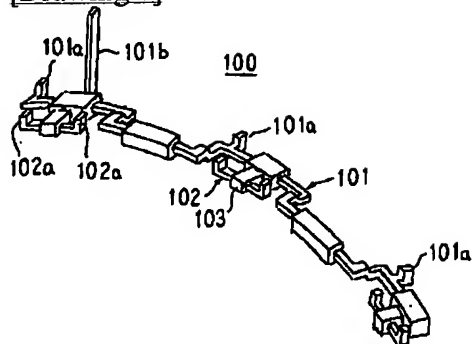


[Drawing 3]

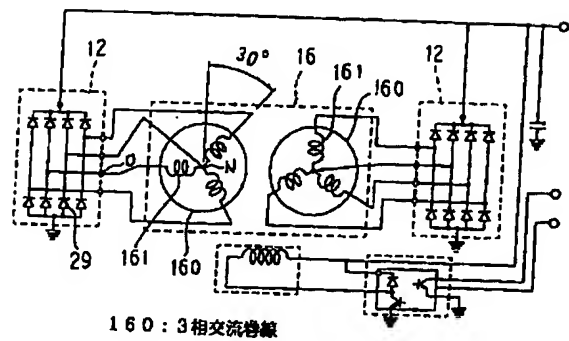


103: 絶縁性樹脂  $C_{1-1}$ : 同一番地渡り結線

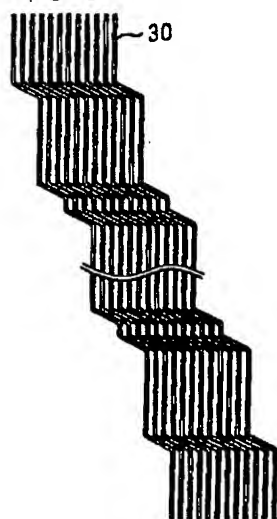
[Drawing 6]



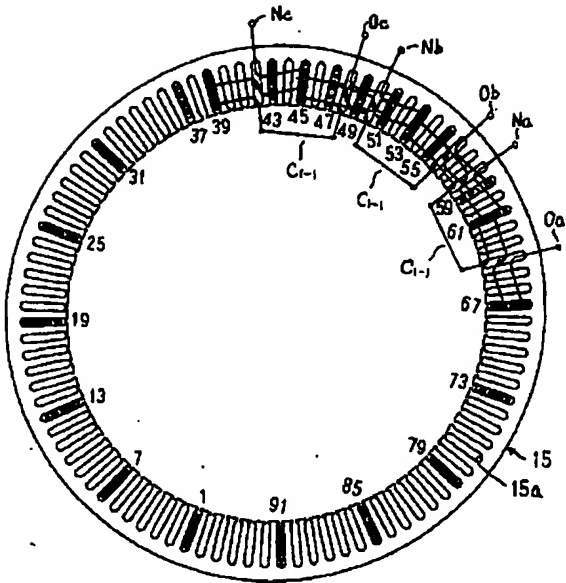
[Drawing 7]



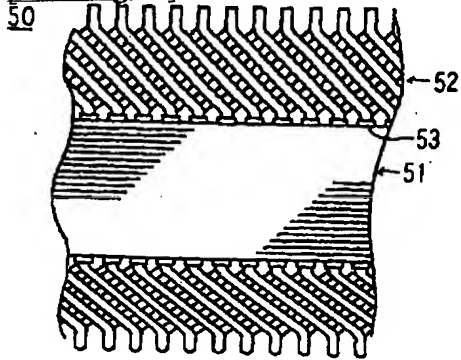
[Drawing 8]



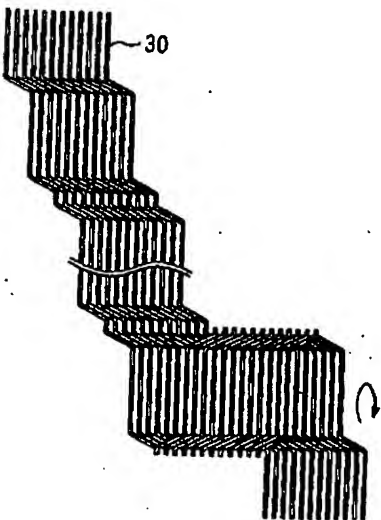
[Drawing 5]



[Drawing 22]



[Drawing 9]



[Drawing 10]

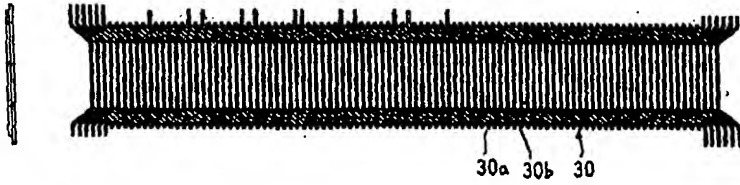


(a)

(b)

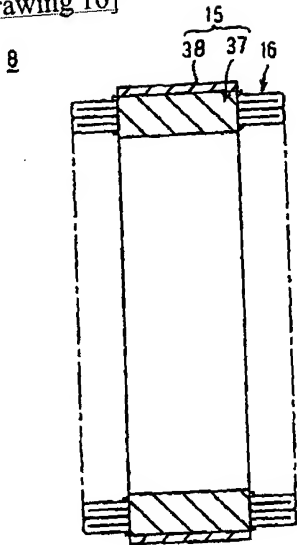
90A

90A

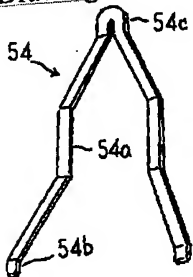


90A : 巻線アセンブリ

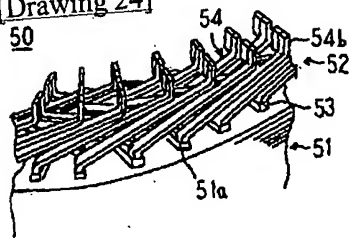
[Drawing 16]



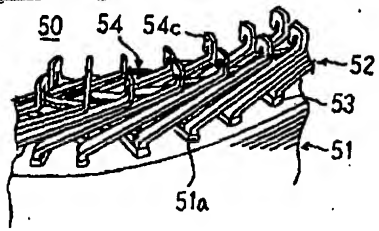
[Drawing 23]



[Drawing 24]



[Drawing 25]



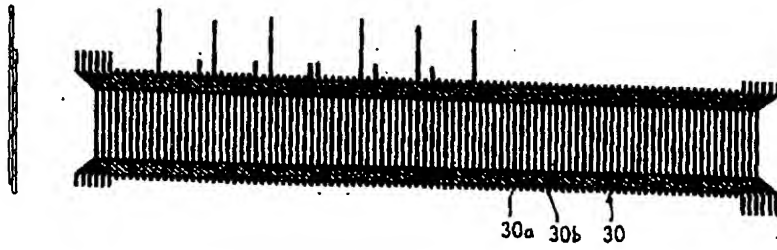
[Drawing 11]

(a)

(b)

90B

90B

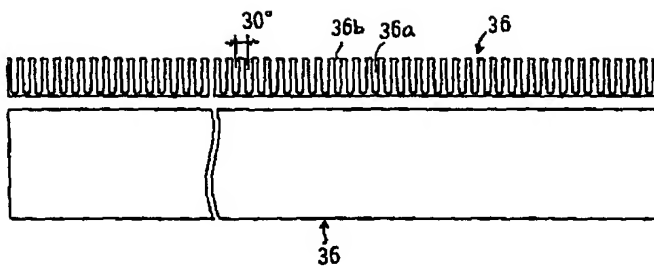


90B : 巻線アセンブリ

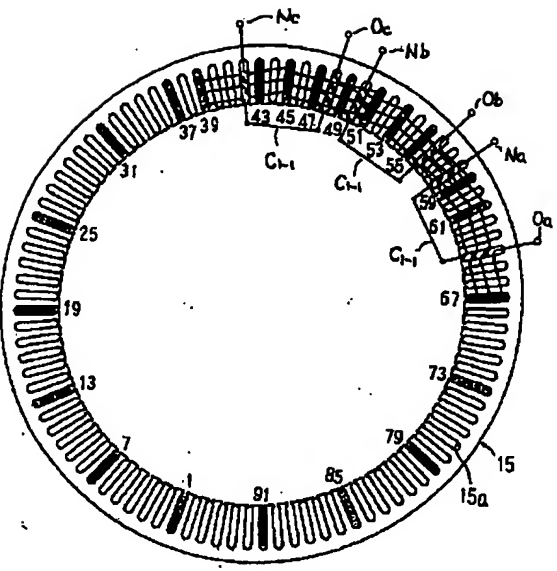
[Drawing 14]

(a)

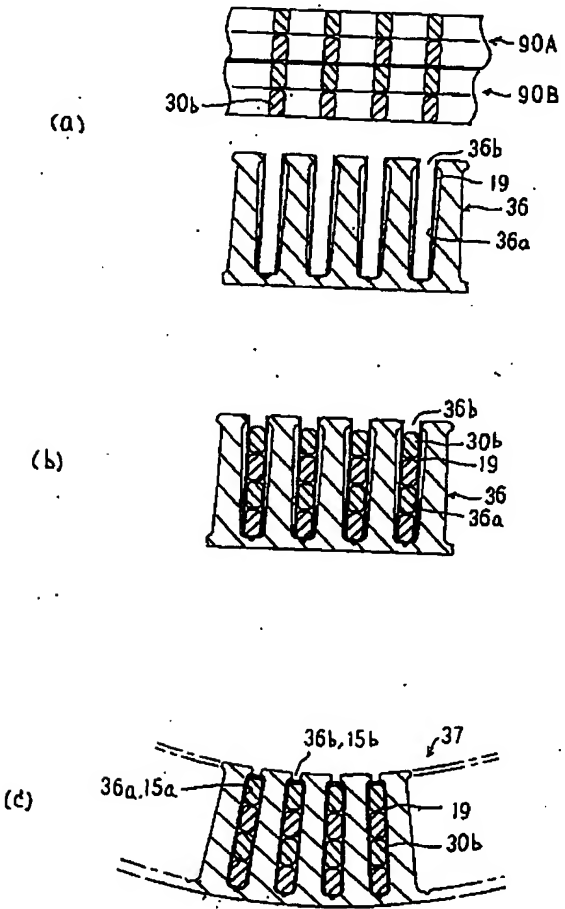
(b)



[Drawing 20]



[Drawing 15]



[Drawing 17]

